THE GOVERNMENT OF MALAYSIA
THE STATE OF SARAWAK

MIRI-BINTULU

REGIONAL PLANNING STUDY

SUPPORTING REPORT

No. 8

INDUSTRIES AND PRIVATE SERVICES

—1974—

HUNTING TECHNICAL SERVICES LTD. LONDON

HOFF AND OVERGAARD COPENHAGEN

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Linear Measures:

1 inch	=	25.4 millimetres
	=	2.54 centimetres
1 foot (12 inches)	=	0.3048 metre
1 yard (3 feet)	=	0.9144 metre
1 chain (22 yards)	=	20.117 metres
1 mile (1 760 yards)	=	1.609 kilometres

Square Measures:

1 square inch	=	6.45 square centimetres
1 square foot	=	9.29 square decimetres
1 square yard	=	0.836 square metre
1 acre (4 840 sq. yards)	=	0.405 hectare
1 square mile (640 acres)	=	259.00 hectares

Weights:

1 ounce (16 drams)	=	28.350 grammes
1 pound (16 ounces)	=	0.454 kilogram
	=	12 tahils
1 kilogram	=	1.65 katis
1 cwt (112 pounds)	=	50.8 kilograms
1 ton (20 cwt)	=	16.8 piculs

Measure of Capacity:

1 pint	=	0.568 litre
1 quart (2 pints)	=	1.137 litres
1 gallon (4 quarts) (or 1 gantang)	=	4.546 litres
1 cubic ton	=	50 cubic feet
1 hoppus ton (ton hoppus)	=	50 hoppus feet
1 cubic foot (sawn)	=	2 hoppus feet sawn

CHAPTER 1

INTRODUCTION

The projections of future development in the Study Area indicate the increasing growth that will take place in the economic activities of the manufacturing and service industries. The development in these sectors can neither be planned nor forecast in detail. An outline of the different manufacturing activities has been prepared with examples of analyses of the subsectors, but a total projection within the Action Programme period will necessarily be based on macro-economic calculations.

Throughout the development planning it is anticipated that serious barriers to accelerated economic development will exist, for instance poor transport facilities and lack of trained manpower. Although the Plan provides for improvements in these basic preconditions for development, it would be unrealistic to suppose that the rapid expansion of the manufacturing and service industries will occur spontaneously. A series of preliminary actions and incentives must be established, namely:

- the right political and socio-economic climate must be created, including a positive government attitude towards projects which will be beneficial to the local economy, and a tax policy which promotes positive investment. This condition is already partly fulfilled.
- sufficient training facilities must be made available to educate and provide staff with necessary skills. Training centres, vocational schools and on-the-job training will be basic measures to implement, if industrial development is to be based on local labour as a production factor:
- the establishment of new industries which could become models for development of further industries must be supported;
- the establishment of a new common marketing organisation for Sarawak which can facilitate existing production and trade and which can create new possibilities for the pioneering trades.

These measures should be part of a policy that supports the industrial development effort. Examples of potential manufacturing industries which are commercially feasible have been worked out in subsequent chapters. Considerations of the future structure of the private service sector and guidelines for its development are included in the present Report; the treatment of this subject here must be regarded as complementary to the standards mentioned in Supporting Report 6.

Development of manufacturing industries in the Study Area in the first half of the planning period has been given considerable importance, increasing towards the end of this period.

The proposed expansion of the agricultural sector will gradually be brought to an end when all the agriculturally suitable land is fully developed. Future economic growth must then find its base in the processing of existing crops, the introduction of new crops and methods, and the development of other production sectors.

The manufacturing sector is one other sector which, is most suitable for future further development, because the forestry sector is resource limited, and the local service sectors are incapable of undertaking large-scale basic development with income formation from foreign sources. Although strictly outside the scope of work possibilities of expanding the manufacturing industries have been examined,as a major share of the future development could result from this sector.

In order to illustrate possible enterprises in the manufacturing industries, brief investigations of the economic consequenses of selected industries have been carried out.

The industries analysed in the context have been chosen as representative of different types of manufacturing that would be preferable. Some examples have been analysed in more detail than others, depending on the need to provide basic data for use in immediate private investor negotiations.

The selection of industries for representation in this Report has been based on the following criteria concerning sources of raw material and markets for final products:

- local minerals and market based industry;
- local wood and market based industry;
- local wood and foreign based industry;
- foreign raw material, local market based industry.

CHAPTER 2

GLASS CONTAINER FACTORY

The objective of this pre-investment study has been to identify the possibility of establishing a glass manufacturing industry in Sarawak, based on local raw materials. The intention has been to analyse the conditions for glass manufacturing based on the bulk production of container glass - mainly bottles. This bottle production should create the necessary requirements for obtaining production which meets the demand for economies of scale in a medium sized glass producing industrial unit.

With a basic production of bottles and other containers, supplementary production could be added, including fancy glass wares and certain products for the construction industry (e.g. glass tiles and mosaics). The enterprise should be operated along ordinary commercial lines and consequently meet the demands for commercial feasibility. However, a pioneer industry status during the first years of operation would be a desirable and probably necessary arrangement, including intermediary protection from competing industries outside the State. The present study discusses the question of location, product line, techniques and economic implications.

2.1 PRESENT STATE OF THE INDUSTRY

There is at present no glass industry in Sarawak, Sabah or Brunei. Although silica-sand, which is a fundamental raw material in glass production is available in both the First and Fourth Divisions of Sarawak and at certain locations in Brunei and Sabah, no effort has been made so far to utilise this resource.

However, container glass manufacturing is a well established industry in Peninsular Malaysia. At present four such establishments are producing or will be producing before the end of 1973/74. The total capacity of these units at that time will be approximately 290 tons daily of glass ware, which will probaly be considerably more than the demand within Peninsular Malaysia.

The factories include <u>Kuala Lumpur Glass Manufacture Sendiran Berhad</u>, which is a subsidiary of the Australian ACI group. The South East Asia management of this group is situated in Singapore (Singapore Glass Manufactures) and it could be assumed that production at the Kuala Lumpur factory is closely linked to the Singapore factory. This will have a certain impact when export market possibilities are considered. The Kuala Lumpur factory partly uses the machinery from a former Australian factory and the 90 tons daily capacity of this factory was met by a reduction of the Singapore factory's production (one furnace was pulled down). The 1971 production was approximately 59.5 mn units of bottles and miscellaneous containers which is probably around 70 per cent of the full capacity. The total plant investment was estimated at $6.2 mn by the end of 1969.

Malayan Glass Factory Berhad is a Johore Bahru based company representing interests from the beer and soft-drink producers (the Fraser and Neave group), which thus extend their financial influence into the producers of bottles for the beverage industry. The Johore factory has a capacity of 90 tons daily which amounts to approximately 80 mn bottles and other containers at full capacity production. The 1971 production was 10 mn units or less than 15 per cent of full capacity. The book value of the plant in 1971 was assessed at $4.9 mn.

It should be noted that the number of units produced does not necessarily correspond to the daily capacity of the factory furnaces. Different product-mix will influence the unit/ton figure.

JG Glass - Containers (Malaysia) Sendirian Berhad. This Selangor based company is financially related to a major Indian glass producer. The capacity of the factory is planned to be 60 tons daily and production should be mainly concentrated on bottles, jars and other container glass wares. As the factory is not yet in operation the utilisation of capacity is still unknown but a production/capacity rate of 65 per cent is envisaged for the first years of operation. The establishment cost in 1968 was estimated at $1.8 mn but substantial increases in this figure are expected when final construction costs are assessed. The total number of containers produced at full capacity would amount to at least 50 mn units per year.

Endura Glass-ware Sendirian Berhad is another Peninsular Malaysian glass factory which should start production in the near future. This factory is planned at a capacity of 40 tons daily, mainly of bottles and other containers. The capacity utilisation in the first years of operation is estimated at about 80 per cent corresponding to approximately 40 mn units). The factory should be established at a total cost of $2.5 mn and is financed with a substantial contribution of Singapore capital.

Another recently established glass-factory in Selangor (The Eastern Glass and Lighting Sendirian Berhad) is producing glass containers but as limitations have been imposed in the granting of its pioneer status this factory does not produce bottles. However, the factory has applied for an extension of its present 10 tons daily tank furnace and a pot furnace with a bottle manufacturing line. The present establishment is an all Malaysian company with a total investment of $1.15 mn.

The total capacity of the existing container glass factories in Peninsular Malaysia will, within the next few years, amount to 250 mn to 300 mn units per year which must be considered as more than adequate for a population of 9.5 mn with sufficient means of transport to facilitate a considerable collection and reutilisation of used glass containers.

2.1.1 Summary

Capacity consideration alone could not justify a glass manufacturing plant in Sabah or Sarawak. Only competitive production costs and better location (with reduced freight costs) could justify a plant in Sarawak. This would have to be based on local market demand in Sabah, Sarawak and Brunei, as production for markets in Peninsular Malaysia would not appear to be economically feasible.

2.2 MARKET ANALYSIS

2.2.1 General

The estimates of the consumption trends for bottles and other containers depend strongly on the drinking habits and the location of the beer and soft drink manufacturing establishments. Beer and soft drinks should consequently be manufactured or bottled locally if a market for this container type is to be considered.

It is recommended to link the establishment of a glass factory with a future bottling plant whereby a market for the glass containers is secured. The economic consequences and the feasibility of a beer bottling plant in this part of Malaysia will not be dealt with in detail here; the present investigation of market possibilities for Sarawak glass products will thus assume that local soft drink and beer production is taking place and that a reasonable percentage of the local consumption of drinks is bottled in Sarawak. By assuming a Sarawak based manufacture of drinks, the projections for the glass bottle market can be derived from the future consumption of soft drinks and beer in Sarawak, Sabah and Brunei.

Analyses of the price elasticity for both soft drinks and beer in other countries indicate that a short term elasticity is recognisable but that immediate reactions on price changes tend to be smoothed out within a short time. As the direct price elasticity reflects the change in the consumption of a product caused by a change in the price of the same product, cross price elasticity reflects the impact on the demand for a product when changes are made in a competing product's price.

Although a certain cross price elasticity is perceptible in the soft drinks and beer market, detailed studies in this field have not been possible during the project term. However, it is relevant to consider this aspect as the introduction to the market of locally manufactured (or bottled) brands with consequent price reductions will probably change the distribution pattern of sales between the brands marketed in this area.

The income elasticity for soft drinks and beer is certainly positive, which again indicates that any rise in income level will cause increased consumption of soft drinks and beers.

Assumed income/consumption ratios, which are based on household budgets in Sarawak urban communities, show the following relation between income and beverage consumption:

Monthly expenditure on beverages in $:	Monthly Income:-			
	$200	$400	$800	$1 500
Beer	0.35	1.75	3.75	10.50
Stout	0.25	0.75	1.10	2.00
Soft drinks	0.40	0.80	2.50	5.10

2.2.2 Soft Drinks

The statistical information on the consumption of soft drinks is neither detailed nor very reliable. The supply of soft drinks to Sarawak, Sabah and Brunei is covered by imports and local manufacturing.

The imports into Sarawak and Sabah are of diminishing importance as the brand products of export quality which were formerly imported are now manufactured in local plants in Kuching and Kota Kinabalu. The traditional local production of aerated water is continued in smaller manufacturing units. The production in these factories is probably st ble as the increased demand for ready bottled drinks is apparently absorbed by the large producers. The present consumption of soft drinks in Sarawak, Sabah and Brunei is estimated at:-

	Number Bottles (millions per year)
Sarawak	35
Brunei	1
Sabah	14

The large manufacturers cover up to 60 per cent of this demand, while local smaller aerated factories supply the remaining 40 per cent. The market is sharply divided between the two groups of manufacturers and an increasing number of brand conscious consumers tend to demand the advertised and well marketed products from the large manufacturers.

As far as relevance to the glass industry is concerned only the large brand drink manufacturers will be considered. This is due to the fact that the smaller factories are expected to get a decreasing market share and that they usually cover their bottle consumption through collection of disposed bottles. At present the smaller manufacturers collect used bottles from coffee shops at a price of three to four cents per unit, a price which does not reflect any cost structure but only the present production pattern according to which multi-use bottles are used as disposable containers. As at least one of the larger beer brands will continue this trade in the years to come it would be unrealistic to count on any demand for new bottles from smaller producers of soft drinks.

The present consumption of brand soft drinks is mainly concentrated on the F & N products which dominate the market with a 50 to 60 per cent share of total consumption. The sales of the F & N companies at present are as follows:-

	Number Bottles (thousand per year)
Sarawak	20 200
Sabah (approx.)	8 000
Brunei	400 (+ 950 in tins)
Total	28 600

The consumption of bottled soft drinks and beer varies considerably from year to year. The explanation for this uneven development in consumption is due to different factors of which climate, crop prices, and changes in tariff and taxation regulations are the more important ones. Consequently the present production figures are calculated on an average basis. In the consumption forecasts the average figures are projected with a growth rate which is related to past consumption trends and expected development in income. Thus the F & N consumption figures would be:-

	1970	1975	1980
	(in thousand	bottles per	year)
Sarawak	20 200	28 000	40 000
Sabah (approx.)	8 000	11 000	15 000
Brunei	400	500	600
Total	28 600	39 500	55 600

Other soft drink manufacturers' production will probably be of marginal importance to the market for new bottles.

2.2.3 Beer

The consumption of beer in Sarawak and Sabah is the subject of sufficiently reliable registration as no beer is brewed in this area. All beer is imported, and as such is registered in the external trade statistics. As in the case for soft drinks, beer is subject to varying demand.

Total imports of lager type beer were:

	1968	1969	1970	1971	1972
	(in thousand gallons)				
Sarawak	296.3	399.2	473.2	433.4	609.8
Sabah	361.8	457.7	-	424.1	528.2
Brunei	225.6	270.6	262.8	290.2	319.7
Total	883.7	1 127.5	-	1 147.7	1 457.7

Consumption of stout was smaller than beer but still comparatively large in relation to the known lager/stout production ratio in European countries.

Total import of stouts were:

	1968	1969	1970	1971	1972
	(in thousand gallons)				
Sarawak	192.2	203.6	256.4	249.4	206.6
Sabah	256.7	289.3	-	328.2	343.2
Brunei	42.6	49.4	59.3	55.5	63.9
Total	491.5	542.3	-	633.1	613.7

There is no indication of a decline or stagnation in stout consumption. Lager type beer consumption might be increasing at a higher rate but this development is only just recognisable and it does not indicate any specific change in the consumption pattern. The expected development in the consumption of beer is indicated in Table 2.1 based on past trends and projections of future income.

TABLE 2.1 PROJECTED BEER CONSUMPTION 1970-1980
(thousand gallons)

		1970	1975	1980
Sarawak	Lager	440	575	750
	Stout	240	280	340
Sabah	Lager	440	555	700
	Stout	305	380	470
Brunei	Lager	275	330	400
	Stout	55	65	75
Total	Lager	1 155	1 460	1 850
	Stout	600	725	885
	Both	1 755	2 185	2 735

As the distribution of the sales of different brands is relevant to the establishment of a possible beer bottling plant in Sarawak a rough indication of present brand sales is given in Table 2.2.

TABLE 2.2 LAGER BEER SALES IN SARAWAK

	Per cent	Thousand gallon
Anchor	46	532 000
Tiger	12	138 000
(total Malayan Breweries Limited MBL)	(58)	(670 000)
Carlsberg	33	381 000
Gold Harp	9	104 000
Total	100	1 155 000

Total stout sales of 600 thousand gallons are almost exclusively "Guinness", the market share of which amounts to more than 99 per cent of all stout sales.

A bottling plant in Sarawak sited near a glass container factory would probably involve one of the following breweries - Malayan Breweries Limited, Guinness or Carlsberg. However, in order to obtain a more economic size and a better utilisation of capacity, it is relevant to consider a joint venture between interested breweries.

Carlsberg is looking for a larger share of the markets in Sarawak, Sabah and Brunei, and Guinness might well wish to cut production costs in order to increase its competitiveness in the Malaysian beer market, which is at present dominated by MBL. For reasons given below a combination of Guinness and Carlsberg would appear to be the most likely possibility.

Considering the probability that local production would increase its market share, two combinations are illustrated in Table 2.3.

TABLE 2.3 COMPARATIVE PRODUCTION FIGURES FOR BEER MANUFACTURE (thousand gallons)

	Sarawak plant	Peninsular plant
Situation I	Carlsberg/Guinness Stout	MBL and others
1975	1 305	740
1980	1 735	860
Situation II	MBL	Carlsberg/Guinness and others
1975	875	1 310
1980	1 200	1 535

It should be noted that the Carlsberg/Guinness combination in a possible Sarawak plant would include the bottling of Guinness stout and Carlsberg lager - the production of Guinness lager beer types are assumed to continue to be produced in Peninsular Malaysia. For various reasons Situation I is considered to be the most relevant. The technique required to containerise and bottle outside the brewery is familiar to both Carlsberg and Guinness. At the same time the capacity of these breweries might indicate their readiness to accept an involvement that could secure a larger share of the growing Borneo market. At present MBL does not seem inclined to enter into production which is unfamiliar to the present technical management.

2.2.4 Other Containers

Large containers for food conservation and pickled produce are subject to a very high re-collection rate. Re-use of these containers is common and the annual import consequently does not exceed 50 000 units. The market for these containers will thus be limited.

Glass-ware for household purposes includes low cost pressed table ware. Mainland China and France have traditionally covered this market, with almost identical products. Production of specially pressed tumblers in already accepted designs would thus create a good possibility for competitive import substitution.

Glass-ware for other purposes would, in a mass production context, be limited to cups for latex tapping. As the basis for the proposed glass production should be pressed glass-ware and as the size of the plant necessitates a limited number of products it has been attempted to identify the ones which are in a sufficiently large demand and at the same time suitable for production in a local, medium sized plant.

The demand for glass cups for rubber (latex) collection is assumed to increase in the years to come. Rubber production in Sarawak and Sabah is expected to concentrate increasingly on the high yielding units. Consequently collection of latex will in the future be still more standardised, and more effective ways of collection will be investigated. The present known techniques include cup-tapping (daily) and poly-bag collecting (weekly). Although the poly-bag process is still not in use in Sarawak it could be envisaged that in future a large share of the latex collection would be carried out this way.

Based on the assumptions that 50 to 60 per cent of latex production will be collected in glass-cups (depending on low/high yield ratio); that future replacement requirements will be according to present experience; that tapping frequences will not fall below the 1972 level; and that the Sarawak and Sabah areas in the future will amount to:

	1975	1980
	(in thousand acres)	
High yield	375	425
Low yield	325	275

the total glass cup requirements will amount to:

	1975	1980
	(in thousand cups)	
Annual glass cup consumption	3 550	3 700

2.2.5 Miscellaneous Glass Products

Fancy Glass

Besides the container production, a series of other products could be linked to an established glass furnace. The construction of a pot furnace for fancy glass products involves only a limited investment. The production of hand blown glass wares would usually increase the labour demand considerably, although an extensive manpower training programme with the introduction of outside know-how would be a pre-requisite. The production of fancy glass wares would, however, require other markets than the local ones and the manufacturing and marketing would thus be along lines other than container production.

In spite of the difficulties in entering the export markets the diversification mentioned could be encouraged. It would be advisable to establish only container production at first, and then at a later stage include more diversified production. Possible market potentials would then be easier to evaluate.

Glass tiles, mosaics etc.

The present demand for glass products for construction purposes in Sarawak and Sabah is only small. The annual import of these goods will probably be around 800 tons for all products for construction purposes (excluding rolled glass for windows). As the domestic market is thus limited, the products mentioned will hardly be able to sustain a specific product line. This applies to rolled/drawn glass as well. The annual import of window glass in Sarawak and Sabah is approximately 2 000 tons which is well below the 5 000 tons that should be considered as the minimum target for a product line of this kind. Although at present it does not seem relevant to consider these products, there could be a need for extension of the furnace capacity to include them at a later stage. A feasible existing container production and an improved transportation sector might then make glass export of new product types desirable.

2.2.6 Demand Outlook

Glass products which could possibly be produced in a plant close to the silica sand deposits in Bintulu would thus be based on mass consumer products. The demand would depend on cost structure, transport facilities and marketing. If the conditions mentioned were acceptable to consumers of the relevant glass wares the natural market should include Sarawak, Sabah and Brunei. The import of empty glass bottles to these areas adds to:

	1968	1969	1970	1971	1972
	(in thousand bottles)				
Sarawak	4 300	5 350	4 850	5 550	5 400
Sabah	850	2 000	-	1 900	2 300
Brunei	200	200	(750)	200	300
Total	5 350	7 550	-	7 650	8 000

Since a substantial part of the bottle import is consumed by soft drink products, the registered import figures will be correlated to the soft-drink consumption figures thus creating the forecast basis for the estimated future demand for soft drink bottles. The demand for soft drink bottles and the like is estimated at:

1975: 11 025 000 bottles/year
1980: 16 200 000 bottles/year

Considering a local beer bottling plant according to the Situation I mentioned in Table 2.3, the total demand for this beer in Sarawak, Sabah and Brunei would be:

	Sarawak produced		
	Lager	Stout	Total
	(in thousand bottles)		
1975	4 785	8 145	12 930
1980	7 015	9 945	16 960

The projected beer consumption is calculated on a specific ratio between pint and quart bottles which at present is approximately 1:5 for beer and 2.5:1 for stout. The future ratios have been estimated at 1:3 for beer while the stout is expected to keep the same ratio.

The demand for soft drink bottles is estimated on the basis of a recovery level percentage of 80 per cent - the present level is 70 per cent. This means that for every 100 full bottles sold, 80 empty bottles will be returned to the factory. The net demand for bottles is thus created through replacement of non returned bottles and net increases in sales.

The present arrangement in Sarawak where empty beer bottles are scrapped will probably be discontinued if a local plant is established. Either a lighter bottle for one-time use will be introduced or re-collection of used bottles will be established. Should re-collection be carried out the recovery rate of used beer bottles will probably be similar to the soft-drink bottle recovery rate. As experience from other countries shows a slightly lower recovery for beer than for soft drink bottles, a 70 to 75 per cent average rate could be expected in Sarawak, Sabah and Brunei. Thus the annual local demand for beer bottles would be:

	Total (in thousand bottles)
1975	3 275
1980	4 250

The use of lighter disposable bottles would involve a bottle demand equivalent to beer consumption. An economic evaluation of bottle cleaning and freight costs will indicate the more feasible solution on this container problem. The average weight of the present soft drink bottles varies between 425 and 460 g. If the future average soft drink bottles is 425 g (Coca-Cola, approximately 300 cc) and 450 g (F & N, approximately 300 cc) the future demand for these would amount to 4 850 tons/year in 1975 and 7 125 tons/year in 1980.

The demand for beer bottle glass would again depend on the size of bottles used. If it is assumed that the average reused bottle weighs 265 g, and 450 g for pint and quart size respectively the demand for beer bottle glass would be 1 150 tons/year in 1975 and 1 500 tons/year in 1980. If a one-time bottle was introduced for both lager and stout the figures for 1975 and 1980 would amount to about 3 170 tons/year and 4 200 tons/year respectively.

The larger food containers of which approximately 50 000 units were imported to the area, would, if an average size of 1 200 is used as a computation unit, amount to 75 tons in 1975 and 95 tons in 1980. Household ware would probably amount to 1.3 mn units per year corresponding to 225 tons of glass in 1975 and 285 tons in 1980. Glass ware for other purposes involves mainly latex tapping cups with an average weight of 225 g. On an annual basis this amounts to a demand for 800 tons in 1975 and 835 tons in 1980.

2.2.7 Competitive Demand Outlook

The calculations concerning the potential demand for relevant glass products in Sarawak, Sabah and Brunei have not included the possibility of competitive supply from existing glass producers in Peninsular Malaysia, Singapore and other traditional suppliers to their market.

However, as it is condition for the establishment of a Bintulu glass plant that it will be feasible in a free competition situation, no other preferences are assumed than those related directly to price and quality. It is consequently not assumed that corporative connections would twist demand into channels that are not competitive on a real price/quality basis. Based on these assumptions the sub-markets mentioned for Sarawak manufactured glass products are expected to be:

Soft drink bottles - market share 75 per cent. A continued outside supply of some specific bottle types is assumed. At the same time it is considered that a complete stoppage of supplies from Peninsular Malaysia bottle manufacturers would be difficult to establish - especially with Sabah soft drink plants. The volume of bottles is calculated partly based on the existing 400 cc soft drink bottles. A complete abolition of this type will probably increase by the change to 300 cc bottles and less.

Beer bottles - market share 100 per cent. The establishment of a beer bottling plant close to the bottle manufacturer excludes other suppliers under ordinary open market conditions.

Large food containers and household ware - market share 50 per cent. Traditional trade channels will probably keep a part of this market which generally must be considered as less transparent and consequently less sensitive to price-changes. Furthermore, it is expected that the Sarawak glass plant will take up only certain mass products and that the demand for glass not produced locally must be met by imported supplies.

Rubber-tapping-cups - market share 90 per cent. Only a marginal supply of this product is expected from outside suppliers. Certain trade channels and future plantation arrangement might justify a 10 per cent import.

Table 2.4 shows the annual demand for locally produced glass products.

2.28 Present Price Structure

A complete picture of the market price for glass containers is difficult to obtain as quantity rebates, cost calculations and other factors appear to disguise the actual cost/price structure. However, a certain indication of the bottle cost ex-factory can be given based on different consumers' information.

TABLE 2.4 PROJECTED ANNUAL DEMAND FOR LOCAL GLASS PRODUCTS IN SARAWAK

Product	Market share per cent	1975 (in tons)	1980 (in tons)
Bottles:			
soft drinks	75	3 640	5 345
beer (local)	100	1 140	1 500
Large food containers:	50	30	50
Household ware:	50	110	145
Other glass i.e. rubber cups:	90	720	760
Total yearly production	-	5 640	7 800
Total daily production	-	16.1	22.3

The sales costs from the major Malaysian glass producers has been calculated at:

	Pint (cent per bottle)	Quart (cent per bottle)
Type 1 (Carlsberg/Gold Harp)	0.14	0.22
Type 2 (MBL)	0.13	0.19
Type 3 (F & N 300 cc)	0.20	

The freight cost which should be added when the Sarawak/Sabah cif costs are considered are as follows:

from Port Klang to	Shipping	Additional charges (in $/ton)	Total
Kuching	37.00	6.00	43.00
Miri	35.00	10.00	45.00
Brunei	36.50	4.00	40.50
Kota Kinabalu	36.25	4.00	40.25
Sandakan	38.50	4.00	42.50
Tawau	44.00	4.00	48.00

When shipped locally the cost would probably be:

from Bintulu to	Shipping	Additional charges (in $/ton)	Total
Kuching	13.00	12.00	25.00
Miri	11.00	12.00	23.00
Brunei	13.00	12.00	25.00
Kota Kinabalu	17.00	12.00	29.00
Sandakan	19.00	12.00	31.00
Tawau	23.00	12.00	35.00

As can be seen the average difference in dollars per ton is around \$12 to \$18 corresponding to two to three cents per empty bottle, according to size. For full bottles this amount should probably be increased by 25 to 30 per cent.

If the establishment of a beer bottling plant in connection with the glass plant in Bintulu is realised (according to the Situation I example above) the savings calculated for 1975 and 1980 could be as shown in Table 2.5.

TABLE 2.5 PROJECTED COST SAVINGS FOR LOCAL GLASS MANUFACTURE

		Present structure costs	Situation I costs
		$	$
Empty soft drink bottles: Port Klang - Sarawak/ Sabah	1975	610 000	-
	1980	890 000	-
Empty soft drink bottles: Bintulu - Sarawak/Sabah	1975	-	340 000
	1980	-	500 000
Full beer bottles: Port Klang - Sarawak/ Sabah	1975	735 000	-
	1980	965 000	-
Full beer bottles: Bintulu - Sarawak/Sabah	1975	-	455 000
	1980	-	595 000
Beer bottles costs	1975	2 325 000	-
	1980	3 055 000	-
Beer collection, shipping, cleaning costs (75 per cent recoverable + 25 per cent new bottles)	1975	-	730 000
	1980	-	960 000
Total freight + bottle costs etc.	1975	3 670 000	1 525 000
	1980	4 910 000	2 055 000
Difference between present structure and Situation I structure	1975		+ 2 145 000
	1980		+ 2 855 000

The calculated savings originate from the beverage industry unless present price policy from the side of the glass manufacturers includes a certain absorption of transportation-costs. That, however, is hardly the case. This means that the establishment of a local beer industry would be attractive and that freight costs are so expensive that a glass manufacturing plant would suffer from most unfortunate economies of scale if competitive production should not be possible.

2.3 GENERAL TECHNICAL DESCRIPTION

2.3.1 Raw Materials

Container glass and ordinary tumbler glass etc. are made from a mixture of certain raw materials, called the batch. Sand is the most important material. It must, however, possess a high content of silica (SiO_2), reasonably uniform grain size, no large grains and only a little dusty material. Besides, the contents of iron oxide (FeO) should be limited, according to the use. Maximum FeO content should not exceed 0.03 per cent for colourless glass containers and other colouring materials should not be present in amounts sufficient to give rise to detectable colours.

Other natural materials used to furnish glass constituents include limestone (which provides calcium oxide $CaCO_3$), dolomite (which provides calcium and magnesium oxides, CaO MgO), feldspar, lepidolite, nephelite-syenite (alumina, silica and alkali metal oxides). Other raw materials consist mostly of carbonates, nitrates and oxides of the elements used. The composition of the raw materials used in container glass is shown in Table 2.6.

TABLE 2.6 RAW MATERIALS CONSTITUENTS FOR CONTAINER GLASS MANUFACTURE IN PER CENT

Constituents	Containers		Tumblers
	Standard	Amber	
Silica	73.3	70.5	70.1
Boric oxide	0.1	-	0.7
Aluminia) oxide Iron)	1.3	2.1	2.6
Lime	9.1	8.9	5.4
Magnesia	0.2	1.4	3.6
Soda	15.4	16.0	16.8
Potassium oxide	0.1	0.6	0.3
Miscellaneous	0.5	0.5	0.5

2.3.2 Batch Preparation

The raw materials are stored in silos and are weighed out and mixed before being sent to the furnace. The weighing might be automatic but could also in medium and small size installations, be manual or semi-automatic. When the raw materials are weighed out, the batch is tipped into the mixer which is very similar to a traditional concrete-mixer. The batch is, after mixing, either discharged into a hopper that holds one production unit or it is elevated and conveyed to a storage silo.

It is usual to include in the mixing a proportion of broken glass of the same composition as that to be made. This is supplied from waste glass incidental to manufacture and is called cullet. Usually this cullet is added in small sized pieces.

2.3.3 Melting

The traditional way of glass-melting in pot-furnaces is still used in special glass production when only small quantities of glass mass are required. Large amounts of glass are melted in tank furnaces (Siemens technique) in which the walls restrict the glass melting area and the flames pass over the surface of the glass. Usually the glass tanks are worked continuously (smaller tanks below 10 tons capacity might be worked as day-tanks).

When the tank is run continuously the batch is charged into one end, the so-called dog house. The homogeneous semi-fluid glass is then removed at the other end for feeding into the forming machines. The tanks are divided into a melting and a working end by a wall. Communication between the two sections is usually through a submerged hole in the wall (dog hole). The heating is carried out by flames passed from side to side (or back to side) over the glass mass. Both oil and natural gas are well suited as sources of energy.

During the melting process which covers several stages, the temperature varies between 1 250 and 1 600 degrees centigrade, depending on the product. The melting and the subsequent refining include decomposition of the carbonates, sulphates and nitrates in the batch with an evulsion of the corresponding acid gasses (CO_2, SO_3 etc.). In addition water is driven off from wet sand and crystalline salts. The more easily fusible materials form a glaze and the grains of silica disappear.

2.3.4 Forming

The most common method for manufacturing glass containers is blow moulding. In this process the globules of semi-fluid glass are transferred to a blowing mould in which compressed air forces them out to their final dimensions. An alternative process for manufacturing containers is by pressing. The moulds for glass container manufacturing are mostly of fine-grained grey cast iron. For most purposes the moulds are used hot at temperatures approaching 600 degrees centigrade.

2.3.5 Annealing

To make commercial glass ware safe to use it must, after receiving its final shaping, be cooled very slowly. This process is known as annealing. Technically this is done by passing the ware on a conveyor belt down a tunnel leer in which a suitable temperature gradient is established.

2.4 RESOURCE ANALYSIS

2.4.1 Raw Materials

In the General Technical Description an indication of the raw material requirements was given. The main quantities necessary for container glass manufacturing for a one ton batch are approximately - varying according to use and colour:-

Material	Tons
Silica sand	0.700
Boric acid	0.005
Alumina/iron oxide	0.020
Lime	0.080
Magnesia	0.025
Soda	0.160
Potash	0.005
Miscellaneous	0.005

Of the components mentioned silica sand is available locally. As this represents 70 per cent by volume of the total raw material requirements, transport costs will be moderate compared to factories importing this material over long distances. Another local raw material is lime which represents around eight per cent of the batch volume. All other raw materials should be imported at prices which include freight costs.

The reason for establishing a glass factory is based mainly on three factors. The first, is the need for industrial development in the Bintulu area; which makes the establishment of a major manufacturing industry desirable. The second is the expected future development in the communications systems - including a deep water port - which places Bintulu in a favourable situation with proximity to both Sarawak and Sabah markets. Third, and not least important, is the availability of glass sand with a high silica content in the area where the future industrial development is envisaged.

2.4.2 Glass Sand

The silica sand deposits have been prospected by several parties following a repeated revival of Japanese interest in Sarawak glass sand which is considered to be of such quality that it would be suitable for the manufacturing of colourless optical glass products. But as these more refined products are not considered, initially, the possible necessity of washing and/or refining the sand is not relevant.

The glass sand occurs on terrace alluvium in the coastal area north of Bintulu but in spite of repeated prospecting efforts, the deposits have never been completely investigated and the total resources are thus unknown. To assess the actual amounts of suitable glass sand it would be necessary to carry out a detailed survey based on transects with proper pitting and drilling in the whole area. Figure 2.1 shows the location of the occurences, which by different sources have been estimated to be at least two to three million tons of high grade silica sand. This figure is probably a very conservative estimate and, assuming that even more extensive occurences are available north of the area mapped, there seems to be no doubt that sufficient sand of acceptable quality will be available in the future. This will, however, only be sufficient for an industry which will probably consume not more than 20 000 tons/year. (In this century not more than 10 000 tons/year). The export of glass sand would change the picture, as the capacity of a large export operation might amount to 400 000 tons/year. Thus a detailed survey should be carried out before a major export of glass sand is initiated. It is probable that an export operation could prevent the establishment of a viable industry.

The samples from prospecting in the relevant areas (Figure 2.1) show a very high silica dioxide and a low iron trioxide content of the glass sand. The numbers on the map represent the samples for the corresponding analysis results shown in Table 2.7. At the same time the depths of the occurences are indicated for the sample locations. Sieve analyses to determine the size and distribution of the sand grains have been carried out both in past prospecting work and by Japanese potential buyers (Marusen Company). In both cases the samples were satisfactory for glass production. As the sand is alluvial only a limited cost will be involved in exploiting it.

The deposits occur at the surface and only little is known about humus contamination; this should therefore be investigated in detail. The depth layer of glass sand in the areas considered for industrial exploitation varies between six and nine feet plus. As less than one foot humus and other non-(glass) silica sand material covers the surface; earth moving equipment in the medium to light class is considered to be sufficient to excavate the glass sand. The sand exploitation operation could be carried out by a one wheel loader which can scrape, haul and dump the glass sand into a stock area on the plant premises. The present data on the sand resources indicate that with a proper plant location, hauling distance should not exceed 250 to 300 yards. The production price at the plant of the glass sand would thus be $4 per ton which, including a tentatively fixed 10 per cent royalty would amount to a total sand raw material cost of approximately $4.50 per ton.

2.4.3 Lime

Considerable limestone occurences in the Niah area are of a hard and pure quality that would make it suitable for glass manufacturing. Quarries have already been in operation on the west side of the Niah river and easy access to the lime thus exists. The quarrying cost amounts to around $8 per ton, which including loading, and road transport to Bintulu would add up to about $20 per ton. If crushing and some sorting is assumed a $25 per ton price at factory is probable.

2.4.4 Other Raw Materials

As no other minerals required for glass production occur in the area in economically exploitable volume all other raw materials would need to be imported.

The raw material prices for container production are calculated as the price at Port Klang with addition of freight - Port Klang to Bintulu. This probably represents the maximum transport costs, and the actual factor cost could thus be subjected to a certain over evaluation. Including freight, the raw materials at factory in Bintulu are assumed to be: boric acid $710 per ton; aluminia oxide $335 per ton, magnesia $95 per ton; soda $50 per ton; potash $85 per ton, other chemicals such as cobalt oxide, arsenic trioxide, barium sulphate, selenium etc, have been calculated on a product-mix price of $320 per ton.

The cost of cullet which can be added to the raw materials batch in different ratios depends partly on the waste factor within the factory and partly on the availability of disposed glass products outside the plant. As a continued supply of disposable containers is expected, the Sarawak/Sabah cullet price will probably be kept at a reasonable level, $30 per ton has been estimated.

2.4.5 Power and Fuel

Possible fuel sources for the melting process range from produced gas, oil and natural gas to electric power. Oil is now the usual source of heating but where natural gas is available this fuel is preferred as costs are generally lower. In a future Bintulu glass factory natural gas as a fuel would probably be most economical when the off-shore gas has been made available to the planned Liquified Natural Gas (LNG) plant.

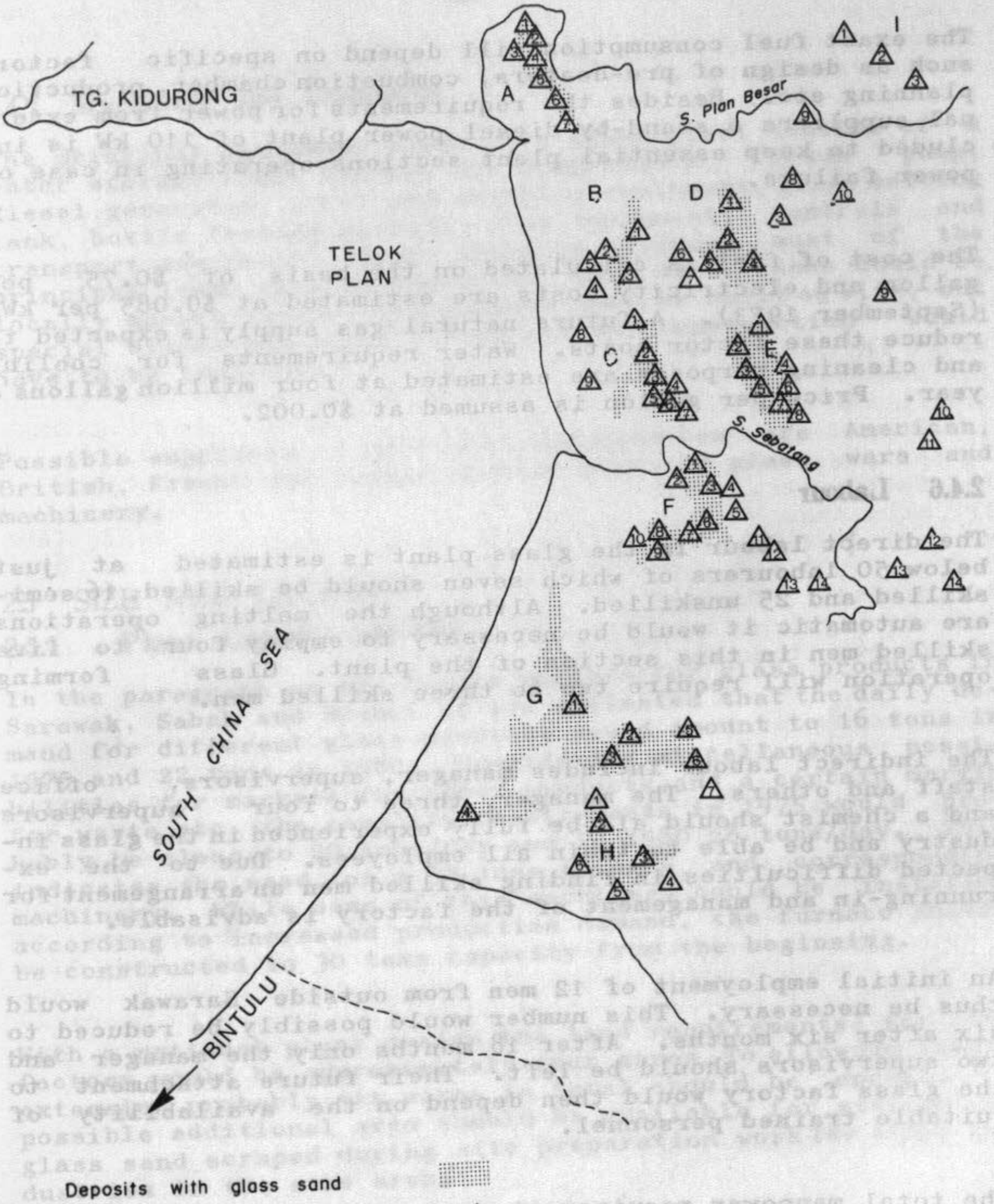
As, however, it might be feasible to start the glass production independently of this power source (i.e. before the start up of the LNG production) the fuel requirement calculations will be based on fuel oil and electricity. The annual requirement for fuel and electric power will probably be

TABLE 2.7 ANALYTICAL DATA FOR GLASS SAND DEPOSITS SHOWN IN FIGURE 2.1

	Number	SiO_2	Fe_2O_3	Depth in feet
A	1	99.45	0.018	5
	2	99.70	0.02	2
	3	99.47	0.018	8+
	4	99.41	0.01	8+
	5	99.05	0.01	8+
	6	99.65	0.03	8+
	7	99.35	0.02	5+
B	1	99.18	0.15	8+
	2	99.05	0.21	8+
	3	99.60	0.02	8+
	4	99.55	0.01	5+
	5	99.79	0.0085	5
C	1	99.35	0.01	8+
	2	99.19	0.02	8+
	3	99.62	0.02	8+
	4	99.40	0.10	8+
	5	99.47	0.02	8+
	6	98.84	0.03	16
	7	99.34	0.04	8+
	8	99.48	0.03	3
	9	98.84	0.03	7.5
D	1	99.45	0.01	5
	2	99.60	0.02	5+
	3	99.48	0.03	5
	4	99.17	0.01	2
	5	99.23	0.01	5+
	6	99.48	0.03	6.5
	7	99.84	0.0087	6
	8	99.48	0.03	3.5
	9	99.48	0.03	10
	10	99.61	0.013	-
E	1	99.25	0.03	5
	2	99.18	0.03	5+
	3	99.70	0.018	-
	4	99.40	0.01	2
	5	99.66	0.02	5+
	6	-	-	0.5
	7	99.73	0.022	-
	8	99.45	0.01	5
	9	99.65	0.013	-
	10	98.84	0.03	8
	11	98.84	0.03	7
	12	99.61	0.013	-
	13	98.84	-.03	5
	14	99.50	0.022	-
F	1	99.25	0.02	5+
	2	99.40	0.03	5+
	3	99.75	0.03	5+
	4	99.80	0.0159	5
	5	98.84	0.03	15
	6	99.15	0.02	5+
	7	99.05	0.01	5+
	8	99.33	0.01	5+
	9	99.08	0.06	8
	10	98.84	0.03	6
	11	99.43	0.018	-
	12	-	-	3.5
	13	99.45	0.018	-
	14	98.84	0.03	7
G	1	-	-	4
	2	99.41	0.018	-
	3	99.76	0.010	3+
	4	99.70	0.027	5+
	5	-	-	0.5
	6	99.50	0.022	-
	7	98.76	0.03	10
H	1	-	-	5
	2	99.66	0.063	3+
	3	99.15	0.018	3+
	4	99.82	0.0091	5
	5	-	-	5
	6	99.83	0.0092	4.5

FIGURE 2.1

LOCATION OF BINTULU GLASS SAND DEPOSITS



around:

fuel oil)		1 500 tons per year
diesel)		
electricity		450 000 kWh per year

The exact fuel consumption will depend on specific factors such as design of pre-heaters, combustion chamber, production planning etc. Besides the requirements for power from external suppliers a stand-by diesel power plant of 110 kW is included to keep essential plant sections operating in case of power failure.

The cost of fuel is calculated on the basis of $0.75 per gallon and electricity costs are estimated at $0.085 per kWh (September 1973). A future natural gas supply is expected to reduce these factor costs. Water requirements for cooling and cleaning purposes are estimated at four million gallons a year. Price per gallon is assumed at $0.002.

2.4.6 Labour

The direct labour in the glass plant is estimated at just below 50 labourers of which seven should be skilled, 16 semi-skilled and 25 unskilled. Although the melting operations are automatic it would be necessary to employ four to five skilled men in this section of the plant. Glass forming operation will require two to three skilled men.

The indirect labour includes manager, supervisors, office staff and others. The manager, three to four supervisors and a chemist should all be fully experienced in the glass industry and be able to train all employees. Due to the expected difficulties in finding skilled men an arrangement for running-in and management of the factory is advisable.

An initial employment of 12 men from outside Sarawak would thus be necessary. This number would possibly be reduced to six after six months. After 18 months only the manager and two supervisors should be left. Their future attachment to the glass factory would then depend on the availability of suitable trained personnel.

The total manpower requirements and the annual cost would then be:-

Direct labour	Number	$
Skilled	7 at $8 000	56 000
Semi-skilled	16 at $5 000	80 000
Unskilled	25 at $3 500	87 500

Indirect labour	Number	$
Manager	1 at $35 000	35 000
Supervisors	5 at $24 000	120 000
Office	7 at $ 3 500	24 500
Other	9 at $ 2 500	22 500
Total	70	425 500

2.4.7 Machinery and Equipment

The principal equipment items of a glass plant consist of a water storage tank, boiler, air compressors, vacuum pump, diesel generator, stock and weighing equipment, glass melting tank, bottle forming machine, shop equipment, controls and transport equipment. Apart from the building most of the principal items must be imported. Only water tanks could be locally manufactured. The furnace must be built on site, but special bricks and steel structures for construction would have to be imported.

Possible suppliers of machinery and know-how are American, British, French and German manufacturers of glass ware and machinery.

2.5 SIZE AND LOCATION

2.5.1 Plant Capacity and Size

In the paragraph on the future markets for glass products in Sarawak, Sabah and Brunei it was estimated that the daily demand for different glass products would amount to 16 tons in 1975 and 22 tons in 1980. Considering miscellaneous possibilities for markets for other products and a certain margin for waste etc. the capacity requirements in 1975 would probably be close to 20 tons/day and in 1980 28 tons/day. This indicates the need for a 30 tons furnace and corresponding machinery. While some of this machinery could be installed according to increased production demand, the furnace should be constructed to 30 tons capacity from the beginning.

With a rational plant design the land requirements for the factory would be approximately four acres. To allow for future extension probably six acres in total should be enough. A possible additional area should be available for storage of glass sand scraped during site preparation work for other industries in the same area.

2.5.2 Location

The location of a glass industry within the Bintulu area depends on the location of glass sand and the future town plan. A mining lease was issued in 1969 to the Glass Sand Company covering the A, D, E and parts of the B fields shown in Figure 2.2 ; it is therefore probable that legal, and may be economic, difficulties will arise in siting the plant on these areas. If other areas be available - and an intermediary calculation seems to indicate that there might be sufficient resources of suitable silica sand in the C and F fields for a future manufacturing industry - a factory could be more easily established there.

Thus the F-field might contain as much as 700 000 tons while the C field and the southern part of the B field might contain around 250 000 tons. However, a detailed investigation of these areas and the one under the issued mining licence should be carried out as soon as possible to confirm these estimates.

If it is assumed that the B, C and F fields are sufficient for the factory a suitable location of the plant would be just north of the Sungai Sebatang as shown in Figure 2.2. This location would probably limit the site preparation costs and at the same time keep the average hauling distance of sand to the factory low, there would be probably be sufficient sand for more than 50 years production within a 2 000 feet (600 metres) distance from the factory; an average hauling distance of 900 feet (275 metres) in the first 20 years could be anticipated. To minimize the distance between the F field and the plant a timber bridge could be constructed at a cost of not more than $10 000.

The future plan for the Bintulu urban area assumes an extended residential area south of the Sungai Sebatang. The future exploitation of the G and H fields is thus not compatible with the town plan. The area just south of Sungai Sebatang will be designated as a green zone which separates the industrial area north of the river from the southern residential area. A respect for these aspects of the town plan will be indispensable and it will possibly be necessary to reduce the excavating work on the F field. At the same time it will probably be expedient to scrape some of the F areas prior to their required use in connection with site preparations in the residential areas. This will hardly have any consequences for the exploitation costs of the glass sand.

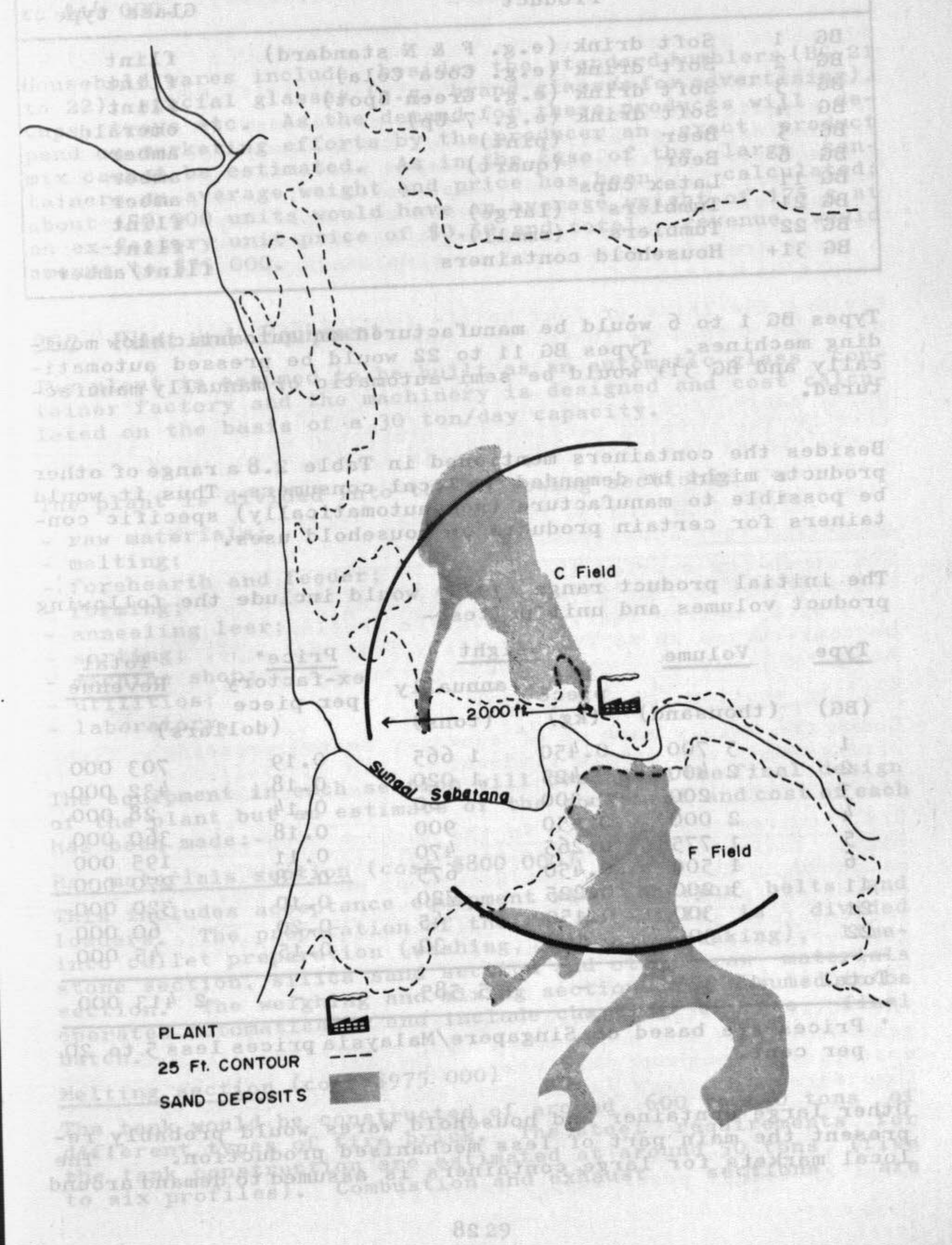
2.6 PRODUCTION ASPECTS

2.6.1 Products

The range of primary products for a Sarawak glass factory would initially be based on certain mass products for which a market has already been established. According to the above analyses of present and future markets for glass containers the range of Bintulu manufactured glass (BG) products

FIGURE 2.2

PROPOSED PLANT SITE LOCATION



should be concentrated on the types shown in Table 2.8.

TABLE 2.8 POSSIBLE RANGE OF BINTULU MANUFACTURED GLASS PRODUCTS

Product		Glass type
BG 1	Soft drink (e.g. F & N standard)	flint
BG 2	Soft drink (e.g. Coca Cola)	flint
BG 3	Soft drink (e.g. Green Spot)	flint
BG 4	Soft drink (e.g. 7-Up)	emerald
BG 5	Beer (pint)	amber
BG 6	Beer (quart)	amber
BG 11	Latex cups	amber
BG 21	Tumblers (large)	flint
BG 22	Tumblers (small)	flint
BG 31+	Household containers	flint/amber

Types BG 1 to 6 would be manufactured on automatic blow moulding machines. Types BG 11 to 22 would be pressed automatically and BG 31+ would be semi-automatic or manually manufactured.

Besides the containers mentioned in Table 2.8 a range of other products might be demanded by local consumers. Thus it would be possible to manufacture (non-automatically) specific containers for certain products or household uses.

The initial product range (1975) would include the following product volumes and unit prices:-

Type (BG)	Volume (thousand)	Weight per piece (kg)	Weight annually (tons)	Price* ex-factory per piece (dollars)	Total Revenue
1	3 700	0.450	1 665	0.19	703 000
2	2 400	0.425	1 020	0.18	432 000
3	200	0.300	60	0.14	28 000
4	2 000	0.450	900	0.18	360 000
5	1 775	0.265	470	0.11	195 000
6	1 500	0.450	675	0.18	270 000
11	3 200	0.225	720	0.10	320 000
21	300	0.150	45	0.20	60 000
22	300	0.100	30	0.15	45 000
Total	15 375	-	5 585	-	2 413 000

* Prices are based on Singapore/Malaysia prices less 5 to 20 per cent.

Other large container and household wares would probably represent the main part of less mechanised production. The local markets for large containers is assumed to demand around

25 000 units. As these containers (BG 31+) are usually manufactured in a range of different sizes an average size and price has been calculated. Thus the average weight is 1 200 g and the ex-factory price $0.55. The price is calculated based on flint colour containers. Total revenue would amount to $14 000.

Household wares include, besides the standard tumblers (BG 21 to 22), special glasses (e.g. brand glasses for advertising), cups, trays etc. As the demand for these products will depend on marketing efforts by the producer an exact product mix cannot be estimated. As in the case of the large containers an average weight and price has been calculated; about 150 000 units would have an average weight of 175 g at an ex-factory unit price of $0.50 and total revenue would amount to $75 000.

2.6.2 Plant and Equipment

The plant is assumed to be built as an automatic glass container factory and the machinery is designed and cost calculated on the basis of a 30 ton/day capacity.

The plant is divided into the following sections:

- raw materials;
- melting;
- forehearth and feeder;
- forming;
- annealing leer;
- sorting;
- machine shop;
- utilities;
- laboratory.

The equipment in each section will depend on the final design of the plant but an estimate of the equipment and cost of each has been made:-

<u>Raw materials section</u> (cost $800 000)

This includes acceptance equipment with conveyor belts and loaders. The preparation of the raw materials is divided into cullet preparation (washing, sorting, breaking), limestone section, silica sand section and other raw materials section. The weighing and mixing sections are assumed to be operated automatically and include charging of the final batch.

<u>Melting section</u> (cost $975 000)

The tank would be constructed of around 600 to 650 tons of different types of fire brick. The steel requirements for the tank construction are estimated at around 50 tons (five to six profiles). Combustion and exhaust sections are designed for oil heating, and processing control would be mainly automatic. Temperature, combustion, glass level, pressure and firing are assumed to be automatically controlled and recorded.

Forehearth and feeder sections (cost $375 000)

These sections are for the mass products designed to the same degree of automation as the melting section.

Forming section (including basic moulds) (cost $800 000)

The expected initial production does not justify forming machine capacity that corresponds to the melting capacity; consequently it is assumed to start production with three machines. The capacity of these would be; a large one with an approximate capacity of 30 000 units per day; and two smaller ones each with a capacity of 10 000 units per day. At a later stage an additional machine at 30 000 units per day should be installed.

Besides the three or four bottle forming machines, two press machines should be installed, and a number of smaller semi-automatic and manual presses should provide moulding facilities for smaller product volumes. The price for these minor units range from $3 000 to $10 000. On this basis the total cost of the forming section is calculated on an average scale, where the last large bottle machine is installed after four years of production, discounted to the year of construction of the initial plant.

Annealing leer (cost $250 000)

The annealing section is assumed to be designed in two parts, one with two 1.5 by 25 metres annealing leers and one with a 1.75 by 25 metres leer. The entire section is suggested to be constructed up to full capacity from the start of production.

Sorting section (cost $75 000)

Costs are mainly made up of conveyor belts, sorting light arrangements and strain finders.

Machine shop (cost $400 000)

The requirements of tools in the machine shop would be quite high. Tools for manufacturing should to a large extent be produced in the plant's own workshop, where complete mould making equipment would also be necessary. The tools would include four to six lathes of different kinds, milling, drilling, grinding, plating machines, etc.

Utilities (cost $375 000)

The utility section should comprise compressors, pumps and a generator. As the requirements for compressed air would be essential throughout the forming process six compressors are considered necessary (capacity: two by 100 kW, four by 50 kW). The pumps would include units for water, oil and vacuum. The generator for standby power supply should be a 110 kW set, which should be able to keep up essential functions in the event of normal power supply failure.

Laboratory (cost $125 000)

An extended laboratory would be necessary in an area where no other analytical facilities exist. Testing and analytical apparatus will provide the necessary basis for production control and research.

Total plant cost according to the above specifications would amount to $3 650 000.

An additional section for decoration of bottles (paint/print technique) should be added to the manufacturing plant as most soft drink manufacturers require pre-decorated bottles. A decoration section, however, could be independent and printing costs would simply be added to the bottle cost. A complete printing unit with a capacity corresponding to the soft drink bottle production, would amount to $200 000.

2.6.3 Buildings and Installations

For the plant a building of 25 000 square feet (2 300 square metres) is considered necessary. Office facilities would probably take up 5 000 square feet (465 square metres). Tanks for water and fuel should be included in this calculation.

TABLE 2.9 GLASS SAND FACTORY DEVELOPMENT COSTS (dollars)

Building (manufacturing area) (brick walls, iron construction without asbestos)	350 000
Building (administration area)	90 000
Interior	
office equipment	35 000
installations etc.	35 000
air-conditioning, decoration etc.	55 000
Tanks and piping	10 000
Total building	575 000
Total plant cost	4 175 000
Total factory cost	4 750 000

2.7 ECONOMIC ASPECTS

2.7.1 Commercial Evaluation

The total economic analysis of the glass plant project has been carried through by means of processing on an IBM 370/145 computor with a program derived from the COBE programme (which is the property of the Economic Planning Unit, in Kuala

Lumpur). The programme includes a series of calculations based on the estimated costs and benefits of the project.

The benefits are the total sales of the different containers at the already assumed prices. The capital costs are presented in Section 2.6.3 and the costs of operation including raw materials, power, fuel, wages, maintenances, and miscellaneous other costs, are presented in Section 2.6.4.

It could, however, be expected that the basis amounts and volumes assumed would not be exactly as forecast, and the economic evaluation is therefore carried out in such a way that these possible variations are illustrated in the statistical analysis carried out by the EOP calculations.

All prices and volumes are calculated at the price (volumes) estimated above - but, alternatives have also been calculated for all prices (volumes) ten per cent above and ten per cent below the estimates. The statistical mean value of the said (volumes) has then been calculated and is considered here as the most probable of the solutions that can be forecast at present.

Besides this specific sensitivity analyses the cash flow from 1974 to 1994 and the present value of the cash flows in the year 1974 have been calculated for the interest rates 7, 10 and 14 per cent as shown in Table 2.10. The cash flows and the internal rate of return are based on the figures assumed in the previous paragraphs. The cash flow year by year is presented in Table 2.12.

The calculations based on the cash flows (see Table 2.12)result in an internal rate of return at 25.2 per cent.

The life expectancy of the plant and its facilities is assumed to be 20 years after the beginning of production.

The terminal value of the assets are estimated in 1994 to be:-

Plant	:	$ 0	(scrap value)
Building	:	$ 0	(scrap value)
Working capital:		$200 000	

The land has not been included in the construction costs and no site value is thus included in the terminal value. This together with the complete write-down to scrap values add to the security margin of the project. Taxes have not been included in the feasibility calculations as status as a pioneer industry and the duration of a possible tax exemption period is unknown. Any taxation of profits from this operation

TABLE 2.10 THE PRESENT VALUE IN THE YEAR 1974, OF THE FLOWS (thousand dollars)

Benefits	Rate of discount per cent 7	10	14
Sales of soft drink bottles	24 500	18 300	12 800
Sales of beer bottles	6 500	4 875	3 725
Sales of other containers	5 900	4 525	3 275
Total benefits	36 900	27 700	19 800
Costs			
Process equipment (plant)	4 175	4 175	4 175
Buildings	575	575	575
Working capital	125	125	125
Raw materials (local)	525	375	275
Raw materials (import)	1 800	1 350	950
Fuel, power	3 650	2 750	1 975
Wages	4 325	3 350	2 475
Maintenance	3 175	2 450	1 775
Administration, misc.	1 900	1 400	1 000
Total costs	20 250	16 550	13 325

The discounted difference between benefits and cost is

	Per cent	$mn
Total benefits - costs	at 7	16.25
	at 10	11.15
	at 14	6.775

The ratio between the discounted benefits and cost is

	Per cent	$mn
Benefit-cost ratio	at 7	1.82
	at 10	1.76
	at 14	1.49

will, of course, reduce the returns to the capital invested regarded from the view point of a private investor, but not from the society.

2.7.2 Social Evaluation

A genuine social cost-benefit-analysis has not been carried through for this plant for which a proper commercial feasibility calculation was considered more appropriate. Thus no weighting has been carried out as far as foreign exchange savings, premium for job creation, redistribution of income and consumption, is concerned. But it should be emphasised that social benefits if included in the calculations would add to the feasibility of the proposed glass plant.

The foreign exchange components and the extra-regional expenditures have been worked out for the two situations: - one with a Sarawak glass production and one without any glass manufacturing. The expenditures for the two alternatives have been discounted at 10 per cent and thereby estimated at:-

	With local glass production		Without local glass production	
	(in million dollars)			
Expenditure:	Foreign	Extra regional	Foreign	Extra regional
Revenue	0.5	7.5	-	20.0
Cost	4.5	7.2	3.0	20.0
Net amount	4.5	0.3	3.0	20.0

It appears that the difference in foreign expenditure components are minor. This is due to the fact that at present and in the future most glass containers for the local market will be produced in Peninsular Malaysia. The extra-regional expenditures vary considerably between the two situations. This means that in the case where no glass production is established in Sarawak, purchasing power and incomes derived from this production will be canalised out of the State.

The calculation of the above expenditures for the local plant is based on plant external cost at $4.5 mn of which $3.5 mn would be the foreign exchange. Discounted external costs of raw materials and spare parts amount to $3.7 mn of which approximately $1 mn would be foreign exchange.

An export of glass products to states outsides the Malaysian Federation is limited to Brunei (estimated $0.5 mn). The residual $7 mn external revenue would originate from sales in Sabah. The alternative in which all glass products should still be imported from factories outside Sarawak is mainly based on the discounted value of future demand of glass containers that could have been manufactured in the proposed plant.

Besides the commercial and currency aspects, the value of establishing an industrial unit with 70 workers directly employed is evident. The possibilities for developing a diversified industrial community in the Bintulu area will depend on the promotion of new product lines in feasible industries.

28 FINANCIAL ASPECTS

The project could be constructed, operated and administered by a joint venture of Sarawak entrepreneurs and representatives of outside companies with sufficient expertise. Considering that a foreign interest should be of relative short duration or at least of eventual minor importance only few corporate structures could be practical.

The foreign expertise which is necessary could simply be taken in as responsible construction-management advisors in an initial period of two to five years. Thus no capital involvement would be anticipated. As possible equipment suppliers would very often be engaged in actual glass manufacturing a joint venture could be advisable as long as a local controlling position could be maintained. In this connection it could be expected that Peninsular Malaysian glass manufacturers would have a positive interest in a Sarawak plant, as the development of a local industry would affect their market expectations.

In a case where the Sarawak Economic Development Corporation would be able to enter a corporation established to develop the local glass production, this solution could be desirable as the public sector would then maintain indirectly, a control in the exploitation of the national resources.

To illustrate a possible financing of the glass manufacturing unit an example of a corporate structure and its outside financing has been worked out as follows.

According to the financing schedule in Table 2.11 all outside capital would be paid back in the period 1975 to 1980. Capital requirements are distributed as:-

Owners	:	$1 075 000 of which $950 000 are paid down in 1974.
Foreign semi soft loans	:	$2.4 mn at 7 per cent interest per annum in 1974. - redemption 1975 to 1979
Institutional loans (MIDF)	:	$900 000 at 9 per cent per annum in 1974. - redemption 1975 to 1980
Private banks	:	$400 000 at 11 per cent interest per annum in 1974. - redemption

This financing follows a pattern which is not unusual for pioneer industries in Peninsular Malaysia. Only foreign soft loans might be subject to some consideration, as a soft loan could be tied with unfavourable equipment offers. Yet, most of relevant equipment supplying countries would have available export subsidy loans for qualified development projects.

TABLE 2.11 GLASS FACTORY FINANCING
(in thousand dollars)

	1974	1975	1976	1977	1978	1979	1980
Equipment, buildings	4750						
Working capital		125	5	5	5	5	10
Capital demand	4750	125	5	5	5	5	10
Owners' capital	-950	-125					
Foreign "soft loans" (machine supply) 7 per cent	-2500	400	700	700	700	575	
Malaysian institutional loans (e.g. MIDF) 9 per cent	-900	100	200	200	200	200	250
Commercial Bank loans 11 per cent	-400		100	100	100	100	225
Total payments	0	500	1000	1000	1000	875	475
Net cash flow		1125	1365	1495	1635	1785	1945
Difference to owners' capital		625	365	495	635	910	1470

The economic feasibility of the project has been worked out with cash flow calculations for the technical life of the plant. Also internal rate of return and net present values for varying interest rates have been calculated.

The cash flow and economic evaluations are based on the volumes, cost and prices worked out above, but to introduce the possibility of changing price relations to the calculations, probabilities for price increases and decreases have been included. In consequence the economic evaluations are based on statistical mean-values and not directly on the cost and prices quoted in the project description. The evaluation has been computed on an IBM 370/145.

Table 2.12 indicates the cash flow from the plant in thousand dollars based on the highest probability of the different price assumptions. The net present values of the single items in the cost/income calculation have been calculated at the interest rates 7, 10 and 14 per cent. The internal rate of return (IRR) is indicated at the foot of the table, and where the IRR is above 25 per cent it is not specified further.

TABLE 2.12 MEAN COSTS AND BENEFITS (THOUSAND DOLLARS)

CONTAINER GLASS PLANT
CONSTRUCTION YEAR: 1975
FIRST YEAR OF OPERATION: 1970
MAXIMUM CAPACITY CIRCA 30 TONS PER DAY
FULL CAPACITY: 1985

YEAR	BOTTLE SOFT	BOTTLE BEER	OTHER WARES	PLANT	BUILDINGS	WORK CAPITAL
1975	0.0	0.0	0.0	-4187.50	-575.10	-125.00
1976	1523.50	465.25	514.00	0.0	0.0	0.0
1977	1645.38	491.30	524.79	0.0	0.0	0.0
1978	1777.01	518.82	535.81	0.0	0.0	0.0
1979	1919.17	547.87	547.07	0.0	0.0	0.0
1980	2072.70	578.55	558.55	0.0	0.0	0.0
1981	2238.52	610.95	570.28	0.0	0.0	0.0
1982	2417.60	645.16	582.26	0.0	0.0	0.0
1983	2611.01	681.29	594.49	0.0	0.0	0.0
1984	2819.89	719.44	606.97	0.0	0.0	0.0
1985	3044.57	759.66	619.66	0.0	0.0	0.0
1986	3045.00	760.00	620.00	0.0	0.0	0.0
1987	3045.00	760.00	620.00	0.0	0.0	0.0
1988	3045.00	760.00	620.00	0.0	0.0	0.0
1989	3045.00	760.00	620.00	0.0	0.0	0.0
1990	3045.00	760.00	620.00	0.0	0.0	0.0
1991	3045.00	760.00	620.00	0.0	0.0	0.0
1992	3045.00	760.00	620.00	0.0	0.0	0.0
1993	3045.00	760.00	620.00	0.0	0.0	0.0
1994	3045.00	760.00	620.00	0.0	0.0	0.0
1995	3045.00	760.00	620.00	0.0	0.0	0.0

YEAR	RAWMATR LOC	RAWMATR IMP	FUEL ETC	WAGES	MAINTENANCE	MISC	TOTAL
1975	0.0	0.0	0.0	0.0	0.0	0.0	-4887.60
1976	-35.10	-119.00	-279.20	-433.70	-132.10	-125.25	1378.40
1977	-37.45	-126.97	-290.37	-433.70	-265.00	-224.00	1283.98
1978	-39.96	-135.48	-301.98	-433.70	-272.95	-239.01	1408.56
1979	-42.64	-144.56	-314.06	-433.70	-281.14	-255.02	1542.99
1980	-45.49	-154.24	-326.62	-433.70	-289.57	-272.11	1688.07
1981	-48.54	-164.58	-339.69	-433.70	-298.26	-290.34	1844.65
1982	-51.80	-175.60	-353.28	-433.70	-307.21	-309.79	2013.65
1983	-55.27	-187.37	-367.41	-433.70	-316.42	-330.55	2196.08
1984	-58.97	-199.92	-382.10	-433.70	-325.91	-352.69	2393.00
1985	-62.79	-213.32	-397.28	-433.70	-335.69	-373.50	2607.61
1986	-63.00	-214.00	-397.50	-433.70	-345.76	-391.79	2579.24
1987	-63.00	-214.00	-397.50	-433.70	-356.14	-398.09	2562.57
1988	-63.00	-214.00	-397.50	-433.70	-365.00	-402.00	2549.80
1989	-63.00	-214.00	-397.50	-433.70	-365.00	-402.00	2549.80
1990	-63.00	-214.00	-397.50	-433.70	-365.00	-402.00	2549.80
1991	-63.00	-214.00	-397.50	-433.70	-365.00	-402.00	2549.80
1992	-63.00	-214.00	-397.50	-433.70	-365.00	-402.00	2549.80
1993	-63.00	-214.00	-397.50	-433.70	-365.00	-402.00	2549.80
1994	-63.00	-214.00	-397.50	-433.70	-365.00	-402.00	2549.80
1995	-63.00	-214.00	-397.50	-433.70	-365.00	-402.00	2549.80

MEAN PRESENT VALUES IN UNITS OF M$ 1000

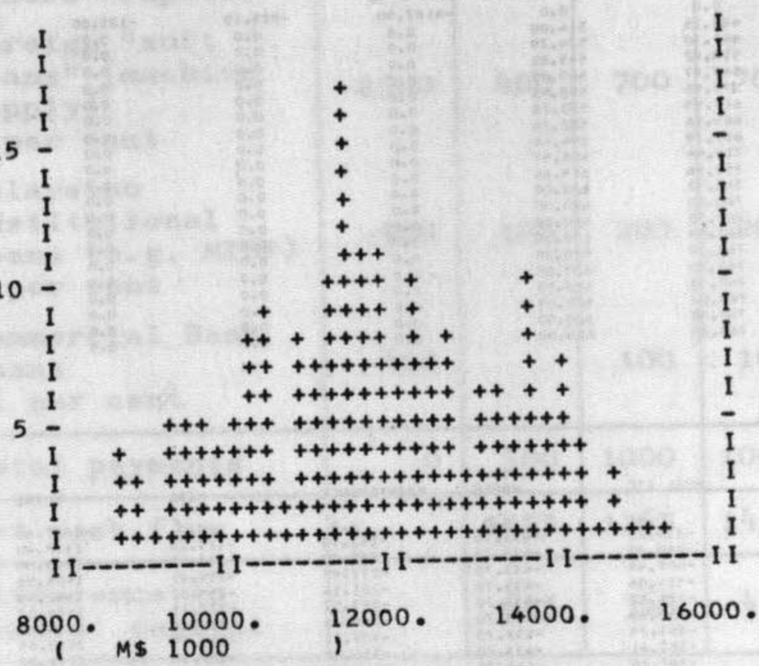
RATE (%)	BOTTLE SOFT	BOTTLE BEER	OTHER WARES	PLANT	BUILDINGS	WORK CAPITAL
7	25723.95	6814.36	6139.18	-4187.50	-575.10	-125.00
10	19983.39	5344.44	4887.18	-4187.50	-575.10	-125.00
14	14888.85	4031.72	3757.43	-4187.50	-575.10	-125.00

RATE (%)	RAWMATR LOC	RAWMATR IMP	FUEL ETC	WAGES	MAINTENANCE	MISC	NET
7	-548.80	-1862.30	-3722.79	-4594.64	-3210.96	-3285.60	16564.78
10	-428.48	-1453.84	-2939.33	-3692.35	-2512.39	-2539.87	11761.13
14	-321.36	-1090.20	-2236.46	-2872.47	-1888.40	-1879.44	7502.07

INTERNAL RATE OF RETURN 25.0 %

Figure 2.3 shows the distribution of a random sample (200) of the net present values at 10 per cent for different cost/price combinations. The distribution is mainly of theoretical interest, but illustrates the probability for the price assumption in the cash flow calculation. The mean value and the standard deviation is calculated below the figure.

FIGURE 2.3 RANDOM SAMPLE OF 200 NET PRESENT VALUES FOR A RATE OF 10 PER CENT PER ANNUM



DISTRIBUTION HAS A STANDARD DEVIATION OF 1530.74 M$ 1000

ABOUT A MEAN OF 11815.85 M$ 1000

2.9 CONCLUSION

As mentioned in the introduction, the main criteria for determining the feasibility of a local glass container production has been based on commercial economics. The Bintulu glass container factory will, however, under the assumptions presented in this report be feasible on both commercial and social standards. The market aspects as presented are apparently quite satisfactory but a few conditions should be emphasised. The situation where a main consumer (F & N) refuses to buy local bottles, even at a cheaper price, is possible. Therefore, negotiations with the relevant soft drink producers and breweries must be conducted prior to establishing the proposed bottling plant in Bintulu. If, however, these markets problems are solved it appears that the production of containers at a rate of 20 to 30 tons per day is quite feasible.

The proposed survey of the silica sand resource areas should be carried out and decisions as to the suitability of an isolated glass sand export should then be made.

The timing of construction and production in this Report is based on a one year construction period and after that a production volume according to the expected demand up to a capacity limit which is reached after 10 years.

It has been assumed that the plant construction would take place in 1974. This might be difficult to accomplish due to the required preliminary surveys and negotiations already mentioned. A later construction time would naturally mean that a higher production volume could be obtained right from the beginning. The short construction period(one year) which adds to the feasibility of the factory is only possible with proper planning.

WOOD BASED INDUSTRIES

Recent efforts to stimulate forestry and timber industries in Sarawak have included the work of the UNDP/FAO Forestry and Forest Industry Development Project, the establishment of STIDC (Sarawak Timber Industry Development Corporation), and the agreement with selected forest industry groups to carry out specific commercial feasibility studies in the hill forest areas of Sarawak. All this has contributed to the present accepted policy, that the concentrated effort to promote the wood based industry already initiated, must continue.

Large forest areas within and outside the Study Area have already been delineated and a number of proposed timber industry complexes based on large licence areas are in the preliminary planning stage. The FAO/UNDP team has described the first step in such a timber complex development, namely the logging and the sawmilling in the Mixed Hill Dipterocarp forest areas north of Bintulu. These are the same areas which are now under study from a commercial angle.

Consequently no attempt has been made here to assess the economic effects of the planned timber industry complexes which might or might not include kilns and production of mouldings, plywood, veneer, particleboard, parquet etc. Instead it has been considered how wood manufacturing units could be attached to either existing or future licence areas as a complementary industry which does not reach the high volume and investment level anticipated for the timber complexes.

The manufacturing industries considered in this context are a medium sized sawmill, a drying kiln a moulding plant an impregnation plant and a pre-fabricated housing industry. They are presented here as a package, in a small timber complex, but they could also be separated and wholly or partly attached to an existing licence area. In fact one or more licence areas within or bordering the Study Area might be suitable for the proposed manufacturing units. In that case the sawmill unit would already be existing and its establishment cost paid. But as each of the units are supposed to be independent industries, which to a limited extend only would benefit from internal economies, one or more links could be excluded from the total package.

3.1 SAWMILL

3.1.1 Market Analysis

Market research on sawn wood products from and in Sarawak confirms the fact that the demand for sawnwood in 1973 has been in excess of the supply. This recent boom for the timber industry makes it more difficult to project the future demand and price level. Generally the market for the tropical hard woods (and light hard-woods) and the light coloured swamp species must be considered as good. But as in the case with resource limited raw materials, under a constant growing demand, price and demand fluctuations might take place but no major change in the total market situation would be expected.

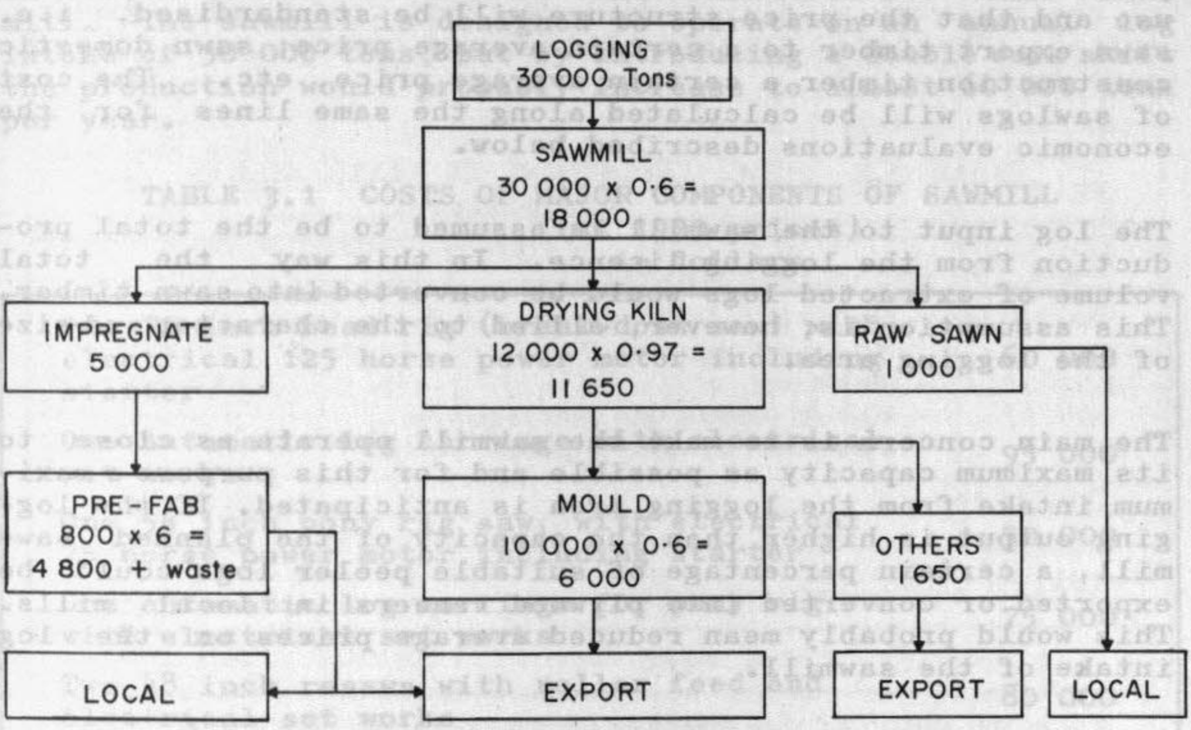
Changes in demand structure might lead to changed market situations for different timber qualities of wood, but in the past there has been no difficulty in finding buyers for both graded and ungraded sawn timber. The rate of development in Sarawak has been increasing but no extraordinary boom in the construction trade has been registered up to 1973. The domestic market has been relatively steady; it is only little influenced by fluctuations in world prices, because the supply to the domestic consumers has mainly been non exportable grades of timber. The export market for Sarawak sawnwood will probably still be dominated by European demand, but a future increase in Japanese sawnwood import from Sarawak must be anticipated with the increased limitations on log export. The major problem for sawn timber is the possibility of selling the unavoidably produced by-product of lower grade material. Some of this material could be exportable because Japan, Korea and mainland China are expected to increase their demand for cheaper timber grades, but the main part should rather be utilised in domestic construction and remanufacturing where substitution of export quality wood should be encouraged.

The domestic market, and especially the local market for sawn timber in the Study Area, is expected to increase considerably in the next few years. The planned development will raise the demand for all sorts of timber, and domestic market oversupply is hardly probable. For general market forecasts for wood products in and exported from Sarawak reference is made to a special study (FAO 1973). In this analysis a certain distribution of the sawn timber is suggested according to the quality of the products:-

- select and better qualities would go to drying kilns and subsequent export or moulding;
- other merchantable timber would go into impregnation for construction purposes;
- residual timber would be marketed directly to local or foreign demand.

The distribution is assumed to be as shown in Figure 3.1.

DISTRIBUTION OF SAWN TIMBER (TONS) FIGURE 3.1



3.1.2 Resource Analysis

The resource base for this sawmill unit has not been described in this context. As mentioned there is within and bordering the Study Area present and future licence areas where a medium size sawmill could be established. The sawmill described here could either replace existing outdated sawmill equipment, or offer an alternative for resources outside the FAO Forest Industry Unit areas. The sawmill and the attached industries could be based on both mixed hill dipterocarp and swamp timbers. For a mixed hill dipterocarp species based production, the distribution of timber could be:-

	Per cent
Meranti (red)	50
Keruing, Kapor	25
Selangan Batu	10
Meranti (white)	5
Others	10

For a sawmill based on swamp species timber the distribution could be:-

	Per cent
Ramin	25
Alan	65
Others	10

The specific markets for the products of the sawmill would naturally depend on the composition of timber sawn, but in this analysis it is considered that a certain part of the production will be sold as sawn timber for export or domestic use and that the price structure will be standardised, i.e. sawn export timber to a certain average price; sawn domestic construction timber a certain average price, etc. The cost of sawlogs will be calculated along the same lines for the economic evaluations described below.

The log input to the sawmill is assumed to be the total production from the logging licence. In this way the total volume of extracted logs would be converted into sawn timber. This assumption is, however, allied to the character and size of the logging area.

The main concern is to make the sawmill operate as close to its maximum capacity as possible and for this purpose a maximum intake from the logging area is anticipated. If the logging output is higher than the capacity of the planned sawmill, a certain percentage of suitable peeler logs could be exported or converted into plywood veneers in local mills. This would probably mean reduced average prices on the log intake of the sawmill.

3.1.3 Technical Description

As the exact licence areas have not been indicated for the sawmill described, they will not be a determining factor in its capacity; furthermore it has been assumed that market problems will be insignificant. The capacity of the sawmill has been designed according to the standards of a medium size sawmill with a monthly log intake of 2 500 tons. This could, according to local experiences, correspond to an annually logged area of 1 500 to 2 000 acres. With a 25 year cycle, which has been recommended by FAO for mixed hill dipterocarp forest, this would mean a total licence area of 40 000 to 50 000 acres.

The sawmill described here is designed to produce rough sawn, air dried timber of accurate dimensions and good quality, and it is the intention also to cut dimensions of less than 0.5 inches, thus providing suitable timber for construction and other purposes at costs lower than normal. This kind of sawmill is considered to be sufficiently versatile to adapt itself to a wide range of different circumstances and yet it has potentials for expansion of its production into high speed operations for standardised timber markets. The sawmilling process can shortly be described by the following diagram:-

Log ⟶ break-down saw (head rig) ⟶ pony rig ⟶ resaw ⟶
break-down saw (head rig) ⟶ resaw

⟶ cross out (trim saw) ⟶ inspection ⟶ seasoning

The machinery must be capable of converting logs having diameters of down to 18 inches or less, at the same time it is unlikely that many logs will have diameters in excess of 56 inches, which is the maximum size considered for this sawmill. The sawmill is designed to operate on an annual log intake of 30 000 tons, but by introducing a double work shift the production would probably increase to almost 60 000 tons per year.

TABLE 3.1 COSTS OF MAJOR COMPONENTS OF SAWMILL (at 1973 prices) in dollars

One 72 inch head rig (break-down saw) with electrical 125 horse power motor including starter	60 000
One automatic log carriage with electrical set works	95 000
One 54 inch pony rig saw, with electrical 75 horse power motor including starter	50 000
One automatic log carriage for pony rig with electrical set works	75 000
Two 48 inch resaws with roller feed and electrical set works	80 000
Green chain, trim saws, dip tank	35 000
Roll cases, conveyor belts etc.	20 000
Saw doctors and maintenance shop (sharpeners, cutters, stretchers, presser etc.), chain saws	65 000
Handling equipment, winches, one fork lift truck	35 000
Waste disposal system	40 000
Total equipment	555 000
Site preparation, construction and installations	145 000
Total sawmill costs	700 000

In the cost calculation of the sawmill the prices of various types of machinery have been considered. Saw prices are highly differentiated; a 72 inch head rig of European manufacture might cost $95 000 compared to the similar specifications for a Korean rig at $20 000. The estimates in Table 3.1 have been based on equipment of German, Japanese and Malaysian origin, chosen after discussion with local sawmills and foreign consultants.

The establishment costs could vary with the location of the sawmill. In this case it has been assumed that the log intake would be supplied from a log pound. A front end loader is in this case substituted by the less expensive winch. Supply of electricity is assumed to be from Sarawak Electricity Supply Corporation (SESCO), consequently no generators are included in the investment costs. The total capital requirements will include investment costs and working capital. The total investment in fixed assets will be as shown in Table 3.2.

TABLE 3.2 TOTAL INVESTMENT IN FIXED ASSETS
(in dollars)

Land (no costs calculated)	-
Building - office 1 000 square feet at $15 per square foot	15 000
- factory	145 000
- cover sheds 20 000 square feet at $5 per square foot	100 000
Machinery	555 000
Vehicles, one 10 ton lorry	30 000
Office equipment, miscellaneous	20 000
Total cost	865 000

Working capital is specified in a later section.

3.1.4 Operation

The sawmill is designed for management and operation by local personnel. But as the revenue of the operation which is assumed in the economic evaluation is based on highly efficient operations, an intensive period of training during the running-in of the sawmill must be included. It is assumed that a highly qualified sawmill expert would be engaged together with the key personnel of the sawmill six months before production would commence. The training under this supervising expert should continue the first six months of operation, after which time the staff should be sufficiently qualified to operate according to the demanded standards of efficiency. The staffing requirements for a one shift operation are shown in Table 3.3.

TABLE 3.3 TOTAL STAFFING REQUIREMENTS AND COSTS (one shift operation)

		Total
Direct Labour		
Superintendant	1 at $15 000	15 000
Foremen	2 at $11 000	22 000
Assistants	6 at $ 7 000	42 000
Skilled workers	16 at $ 5 000	80 000
Unskilled workers	30 at $ 3 000	90 000
Total Direct Labour Staff	55	249 000
Management		
Manager	1 at $22 000	22 000
Accountant	1 at $12 000	12 000
Clerks	2 at $ 3 000	6 000
Total Management	4	40 000
Total salaries of all staff		289 000

The salary costs during full operation will be reduced during the training and construction period. In the six months prior to full operation the personnel would be:

Manager	1	
Accountant	1	
Superintendant	1	
Foremen	2	- at a probable total salary cost of $100 000
Assistant	3	
Skilled workers	3	
Sawmill expert	1	

Other production costs include, raw materials, power, water and maintenance. The cost of logs at full conversion of the licence production is estimated at $90 per ton hoppus. The log price is arrived at as follows:-

	Per cent	Dollars/ton
Meranti (red)	50	110
Keruing, Kapor	25	90
Selangan Batu	10	120
Meranti (white)	5	100
Others	10	70
Total average	100	100

(log prices are calculated as average 1971 to 1973 Sarawak export prices)

As raw material the log price at a conversion rate of 60 per cent would be $165 per ton.

Power is calculated at $0.09/kWh. The total power requirement is 350 kWh on seven hours in 275 days, in total $60 000 at full capacity or $2 per ton of log intake.

Maintenance of equipment, chains etc. is calculated at 12.5 per cent of equipment cost, in total $72 000 at full capacity, or $2.40 per ton of log intake.

Insurance of plant is estimated at 2.5 per cent of investment, in total $22 000.

Labour insurance is estimated at five per cent of total labour cost, in total $14 000.

The lifetime of the plant is calculated at 20 years. But after 10 years of operation 40 per cent of the plant equipment should be renewed. Transport should be replaced every five years.

3.1.5 Economic Evaluation

The evaluation of the sawmill naturally depends on the price development although a certain ratio normally exists between logs and sawn timber prices. However, if recent trends of increasing wood prices continue, sawmilling will, (if other production factors keep the same cost level) be still more profitable as the investment costs are constant compared to the increased raw material cost and product prices.

The prices of the finished products from the sawmill are calculated at average 1971 to 1973 prices as shown in Table 3.4.

TABLE 3.4 SAWN TIMBER PRICES

	Per cent	Dollars/ton
Meranti (red)	50	250
Kapor, Keruing	25	205
Selangan Batu	10	290
Meranti (white)	5	210
Others	10	150
Total average	100	230

The economic feasibility of the project has been worked out with cash flow calculations for the technical life of the plant. Also internal rate of return and net present values for varying interest rates have been calculated.

TABLE 3.5 MEAN COSTS AND BENEFITS (THOUSAND DOLLARS)

MEDIUM SIZE SAWMILL
CONSTRUCTION YEAR: 1975
FIRST YEAR OF OPERATION: 1976
MAXIMUM CAPACITY CIRCA 30 000 TONS LOG-INTAKE PER ANNUM (1 SHIFT)
FULL CAPACITY: 1978

YEAR	TO MOULDING	TO PRE-FAB	TO EXPORT	TO LOCAL	PLANT	WORK CAPITAL
1975	0.0	0.0	0.0	0.0	-865.00	-541.00
1976	1690.00	808.50	382.40	154.30	0.0	-314.00
1977	1791.40	857.01	405.34	163.56	0.0	-51.60
1978	1892.80	905.52	428.29	172.82	0.0	-15.60
1979	1994.20	954.03	451.23	182.07	0.0	0.0
1980	2095.60	1002.54	474.18	191.33	-30.00	0.0
1981	2197.00	1051.05	497.12	200.59	0.0	0.0
1982	2298.40	1099.56	520.06	209.85	0.0	0.0
1983	2399.80	1148.07	543.01	219.11	0.0	0.0
1984	2422.60	1155.00	546.00	220.70	0.0	0.0
1985	2431.30	1155.00	546.00	220.70	-376.00	0.0
1986	2440.00	1155.00	546.00	220.70	0.0	0.0
1987	2448.70	1155.00	546.00	220.70	0.0	0.0
1988	2457.40	1155.00	546.00	220.70	0.0	0.0
1989	2466.10	1155.00	546.00	220.70	0.0	0.0
1990	2474.80	1155.00	546.00	220.70	-30.00	0.0
1991	2483.50	1155.00	546.00	220.70	0.0	0.0
1992	2492.20	1155.00	546.00	220.70	0.0	0.0
1993	2500.90	1155.00	546.00	220.70	0.0	0.0
1994	2509.60	1155.00	546.00	220.70	0.0	0.0
1995	2518.30	1155.00	546.00	220.70	0.0	0.0

YEAR	LOGS	FUEL ETC	WAGES	MAINTENANCE	MISC.	TOTAL
1975	0.0	0.0	0.0	0.0	-104.50	-1510.50
1976	-2183.70	-43.20	-267.20	-50.00	-156.00	21.10
1977	-2314.72	-45.79	-285.90	-52.00	-165.36	301.93
1978	-2445.74	-48.38	-304.61	-54.00	-174.72	356.37
1979	-2576.76	-50.98	-314.00	-56.00	-184.08	399.71
1980	-2707.79	-53.57	-314.00	-58.00	-193.44	406.85
1981	-2838.81	-56.16	-314.00	-60.00	-202.80	473.99
1982	-2969.83	-58.75	-314.00	-62.00	-212.16	511.13
1983	-3100.85	-61.34	-314.00	-64.00	-219.00	550.78
1984	-3118.70	-61.80	-314.00	-66.00	-219.00	564.80
1985	-3118.70	-61.80	-314.00	-68.00	-219.00	195.50
1986	-3118.70	-61.80	-314.00	-70.00	-219.00	578.20
1987	-3118.70	-61.80	-314.00	-72.00	-219.00	584.90
1988	-3118.70	-61.80	-314.00	-72.00	-219.00	593.60
1989	-3118.70	-61.80	-314.00	-72.00	-219.00	602.30
1990	-3118.70	-61.80	-314.00	-72.00	-219.00	581.00
1991	-3118.70	-61.80	-314.00	-72.00	-219.00	619.70
1992	-3118.70	-61.80	-314.00	-72.00	-219.00	628.40
1993	-3118.70	-61.80	-314.00	-72.00	-219.00	637.10
1994	-3118.70	-61.80	-314.00	-72.00	-219.00	645.80
1995	-3118.70	-61.80	-314.00	-72.00	-219.00	654.50

MEAN PRESENT VALUES IN UNITS OF M$ 1000

RATE (%)	TO MOULDING	TO PRE-FAB	TO EXPORT	TO LOCAL	PLANT	WORK CAPITAL
7	23384.93	11078.53	5238.54	2115.56	-1088.40	-892.26
10	18463.34	8762.20	4143.39	1673.11	-1035.77	-880.82
14	14044.49	6677.98	3157.96	1275.02	-986.21	-866.67

RATE (%)	LOGS	FUEL ETC	WAGES	MAINTENANCE	MISC.	NET
7	-29918.31	-592.35	-3250.59	-662.73	-2222.81	3190.09
10	-23663.32	-468.46	-2600.45	-522.88	-1781.73	2088.59
14	-18035.06	-356.99	-2010.66	-397.62	-1384.48	1117.74

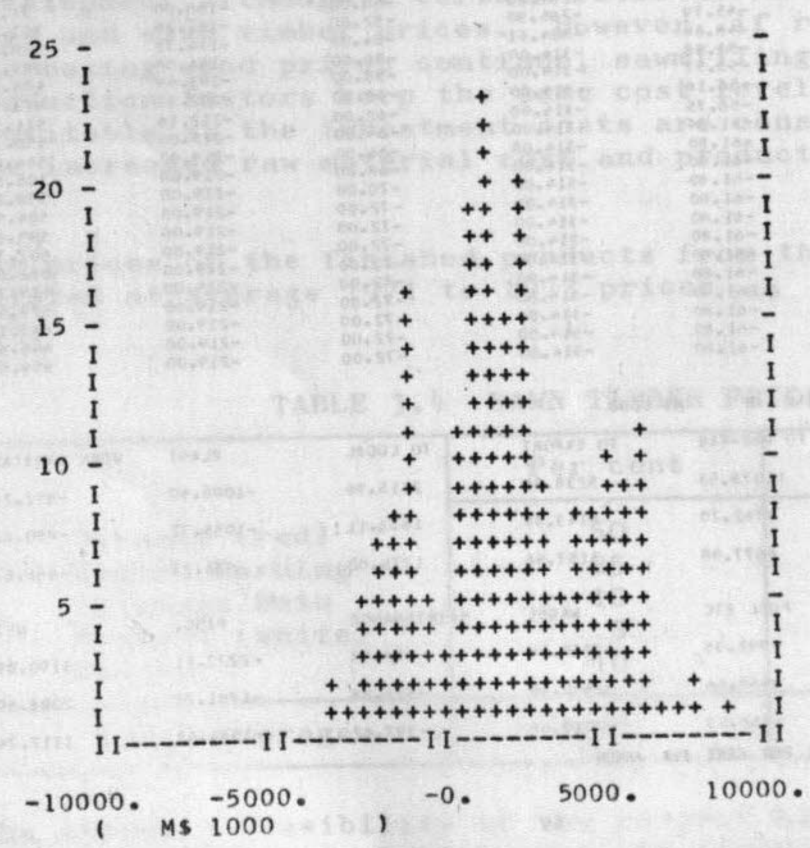
INTERNAL RATE OF RETURN ABOUT 22 PER CENT PER ANNUM

The cash flow and economic evaluations are based on the volumes, cost and prices worked out above, but to introduce the possibility of changing price relations to the calculations, probabilities for price increases and decreases have been included. In consequence the economic evaluations are based on statistical mean-values and not directly on the cost and prices quoted in the project description. The evaluation has been computed on an IBM 370/145.

Table 3.5 indicates the cash flow from the plant in thousand dollars based on the highest probability of the different price assumptions. The net present values of the single items in the cost/income calculation have been calculated at the interest rates 7, 10 and 14 per cent. The internal rate of return (IRR) is indicated at the foot of Table 3.5.

Figure 3.2 shows the distribution of a random sample (200) of the net present values at 10 per cent for different cost/price combinations. The distribution is mainly of theoretical interest, but illustrates the probability for the price assumption in the cash flow calculation. The mean value and the standard deviation is calculated below figure 3.2.

FIGURE 3.2 RANDOM SAMPLE OF 200 NET PRESENT VALUES FOR A RATE OF 10 PER CENT PER ANNUM



DISTRIBUTION HAS A STANDARD DEVIATION OF 2502.42 M$ 1000

ABOUT A MEAN OF 2185.23 M$ 1000

3.2 DRYING KILNS

The introduction of drying kilns in the Sarawak wood manufacturing industry has in the past been limited to moulding and plywood factories. The production of timber of a higher quality would necessitate the establishment of drying kilns capable of drying sawn timber for export, and remanufacturing such as mouldings, parquetry etc. The installation of kilns for the drying of export sawn timber would also add to the production of high value-added-products in Sarawak industries.

The basic idea in kiln drying is the reduction of the moisture content of the timber in a heating chamber instead of the traditional open air seasoning. The seasoning process is thus reduced to a few days instead of several months. Furthermore it is not possible in the Sarawak climate to dry the timber sufficiently for a number of purposes. It is difficult to reduce the moisture content in air seasoned timber below 17 to 18 per cent, and as furniture parts, panelling, and woodwork for export to temperate climate countries would normally require a maximum of 10 to 12 per cent moisture content, it is necessary to establish drying kilns if the demands of the market are to be met. A drying kiln is usually a closed chamber, constructed of concrete, bricks or metal, in which a variety of equipment such as fans, heat coilers and steam pipes, are installed to circulate hot air and ventilate the timber.

A moulding factory should therefore be constructed close to the drying kilns. According to the drafted distribution of the timber production of the sawmill and the capacity of the moulding plant, the intake of sawnwood for mouldings should be around 10 000 tons per year which would correspond to a moulding capacity a drying kiln plant of 12 000 tons capacity. The harmonisation of the sawn-timber drying-moulding process would be advisable, especially with the possibility of exporting selected sawnwood species in dried condition. The dried timber export would with a full scale moulding operation, amount to about 1 500 to 1 700 tons per year.

There are specific marketing problems associated with mouldings manufacture and these are dealt with in Section 3.4 following.

3.2.1 Market Analysis

The market for kiln dried timber is divided between the demand from the local remanufacturing industry and sawn timber exports. The drying kilns would in this context be based on the capacity of a moulding factory, with export of sawnwood as a sideline and capacity regulator.

3.2.2 Resource Analysis

The resource base for the drying kilns is the output from the suggested sawmill. An annual input of high quality sawn timber of 12 000 tons is assumed. The supply is assumed to be constant and storage facilities for raw materials should be kept to a minimum.

3.2.3 Technical Description

The drying kiln envisaged is designed to produce kiln dried sawnwood with a moisture content of eight to 12 per cent. The rough sawn timber input might either be air seasoned, pre-dried or green. In this case the timber is assumed to be short time air seasoned with a moisture content of up to more than 50 per cent. The plant includes drying chambers, ventilators, compressors and boiler. The capacity of chambers and boiler can be calculated as follows:

- Chambers:

  Total intake of sawnwood 12 000 tons per year
  Average drying and loading time: 3 days
  Number of drying cycles per year 360 divided by 3 = 120 cycles
  Capacity requirement for drying chambers 12 000 tons divided by 120 = 100 tons chamber capacity

- Boilers:

  12 000 tons by 1.40 cubic metre per ton = 16 800 tons per year
  16 800 tons/365 days/24 hours = 1.9 cubic metre per hour to be dried
  Moisture content 50 to 60 per cent down to 10 per cent (average)
  Specific weight of timber 600 kg per cubic metre (average)
  Steam requirements per hour = 119 by 600 by 50/50 000 = 1.15 tons/steam per hour

The drying kiln then comprises the major components shown in Table 3.6.

TABLE 3.6 MAJOR COMPONENTS OF DRYING KILN PLANT (estimated at 1973 prices)

	Dollars
Four kiln chambers each 42 feet long (internal), construction, site etc.	110 000
Kiln equipment for four kilns (including controls, spray and vents)	80 000
Compressor	7 000
Boiler plant (capacity as above)	68 000
Rails, carriages etc.	25 000
Total kiln costs	290 000

Various machinery has been considered in the calculation of establishment costs. The above kiln plant is mainly based on Australian systems, which are already known in Sarawak, but both American and English plants can be established at almost similar costs. It has been considered that gas would be a cheap available power source.

The total establishment cost might vary according to the location, but the plant is supposed to be close to both sawmill and moulding plant, thus minimising internal transport costs. Supply of electricity is assumed to be from SESCO, consequently no generators are included in the investment costs.

The total capital requirements will include investment costs and working capital. The total investment in fixed assets will be as shown in Table 3.7.

TABLE 3.7 TOTAL INVESTMENT IN FIXED ASSETS

	Dollars
Land (no costs calculated)	
Building - office 700 square feet at $15 per square foot	10 000
- cover sheds 8 000 square feet at $5 per square foot	40 000
Drying kilns equipment	290 000
Miscellaneous equipment	10 000
Total	350 000

3.2.4 Operation

The drying kiln is designed for operation by local personnel. As control of the process is basically automatic no specific requirements are considered as far as the limited staffing is concerned. The operation time is a full 24 hours and will require the following staffing:

		Total
Superintendant	1 at $12 000	12 000
Assistants	2 at $ 7 000	14 000
Labourers	3 at $ 3 000	9 000
Total	6	35 000

No management is considered necessary, as production is designed to be closely tied to the sawmill and the moulding factory. Running-in costs are assumed to be limited. As construction and installation is estimated to be completed in less than two months, pre-operation salaries will amount to

$4 000. Other production costs include raw materials, power and maintenance. Export sawnwood qualities are $260 per ton; moulding sawnwood $230 per ton.

Power is calculated at $0.90/kWh. Total power requirements are estimated at 50 kWh in 24 hours in 365 days, in total $40 000 per year at full capacity or $3.35 per ton of timber intake. The power supply is initially calculated as fully electrified. At later conversion to natural gas, power costs will decrease considerably.

Maintenance of equipment is calculated at seven per cent of equipment costs, in total $20 000 or $1.65 per ton of intake. Insurance is estimated at 2.5 per cent of plant investment, in total $9 000.

The lifetime of the plant is calculated at 20 years. But after 10 years of operation 30 per cent of plant equipment should be renewed. This covers new compressors, ventilators, boiler improvements etc.

3.2.5 Economic Evaluation

The feasibility of the drying kiln will naturally depend on price and cost developments, but if a moulding plant is considered to be economically justified the kiln plant would be a necessary link in production. Present price-cost structures indicate that the drying kiln plant is feasible as an isolated investment but changes might justify the consideration of the kilns as an integrated part of the moulding manufacturing complex.

As no actual administration overhead is calculated for the drying kilns this plant can be considered as a part of a bigger industrial unit. The price of the kiln dried timber is assumed at:

- dried sawn wood for export $315 per ton
- dried sawn wood for moulding $260 per ton

The export timber will constitute approximately 15 per cent and timber for the mouldings about 85 per cent of the production.

The economic feasibility of the project has been worked out with cash flow calculations for the technical life of the plant. Also internal rate of return and net present values for varying interest rates have been calculated.

TABLE 3.8 MEAN COSTS AND BENEFITS (THOUSAND DOLLARS)

DRYING KILN PLANT
CONSTRUCTION YEAR: 1975
FIRST YEAR OF OPERATION: 1976
MAXIMUM CAPACITY CIRCA 12 000 TONS TIMBER INTAKE PER ANNUM
FULL CAPACITY: 1979

YEAR	DRIED 1	DRIED 2	PLANT	WORK CAPITAL	SAWN 1
1975	0.0	0.0	-350.00	-108.00	0.0
1976	1911.00	382.40	0.0	-53.00	-1690.00
1977	2025.66	405.34	0.0	-25.80	-1791.40
1978	2140.32	428.29	0.0	-15.40	-1892.80
1979	2254.98	451.23	0.0	0.0	-1994.20
1980	2369.64	474.18	0.0	0.0	-2095.60
1981	2484.30	497.12	0.0	0.0	-2197.00
1982	2598.96	520.06	0.0	0.0	-2298.40
1983	2713.62	543.01	0.0	0.0	-2399.80
1984	2730.00	546.00	0.0	0.0	-2422.60
1985	2730.00	546.00	-105.00	0.0	-2431.30
1986	2730.00	546.00	0.0	0.0	-2440.00
1987	2730.00	546.00	0.0	0.0	-2448.70
1988	2730.00	546.00	0.0	0.0	-2457.40
1989	2730.00	546.00	0.0	0.0	-2466.10
1990	2730.00	546.00	0.0	0.0	-2474.80
1991	2730.00	546.00	0.0	0.0	-2483.50
1992	2730.00	546.00	0.0	0.0	-2492.20
1993	2730.00	546.00	0.0	0.0	-2500.90
1994	2730.00	546.00	0.0	0.0	-2509.60
1995	2730.00	546.00	0.0	0.0	-2518.30

YEAR	SAWN 2	FUEL ETC	WAGES	MAINTENANCE	MISC.	TOTAL
1975	0.0	-8.20	0.0	0.0	-12.60	-478.80
1976	-382.40	-28.80	-30.90	-14.00	-40.80	53.50
1977	-405.34	-30.53	-33.06	-14.56	-43.25	87.06
1978	-428.29	-32.26	-35.23	-15.12	-45.70	103.82
1979	-451.23	-33.98	-36.20	-15.68	-48.14	126.77
1980	-474.18	-35.71	-36.20	-16.24	-50.59	135.30
1981	-497.12	-37.44	-36.20	-16.80	-53.04	143.82
1982	-520.06	-39.17	-36.20	-17.36	-55.49	152.34
1983	-543.01	-40.90	-36.20	-17.92	-57.10	161.70
1984	-546.00	-41.20	-36.20	-18.48	-57.10	154.42
1985	-546.00	-41.20	-36.20	-19.04	-57.10	40.16
1986	-546.00	-41.20	-36.20	-19.60	-57.10	135.90
1987	-546.00	-41.20	-36.20	-20.00	-57.10	126.80
1988	-546.00	-41.20	-36.20	-20.00	-57.10	118.10
1989	-546.00	-41.20	-36.20	-20.00	-57.10	109.40
1990	-546.00	-41.20	-36.20	-20.00	-57.10	100.70
1991	-546.00	-41.20	-36.20	-20.00	-57.10	92.00
1992	-546.00	-41.20	-36.20	-20.00	-57.10	83.30
1993	-546.00	-41.20	-36.20	-20.00	-57.10	74.60
1994	-546.00	-41.20	-36.20	-20.00	-57.10	65.90
1995	-546.00	-41.20	-36.20	-20.00	-57.10	57.20

MEAN PRESENT VALUES IN UNITS OF M$ 1000

RATE (%)	DRIED 1	DRIED 2	PLANT	WORK CAPITAL	SAWN 1
7	26185.65	5238.54	-403.38	-192.64	-23384.93
10	20710.67	4143.39	-390.48	-189.07	-18463.34
14	15784.36	3157.96	-378.32	-184.74	-14044.49

RATE (%)	SAWN 2	FUEL ETC	WAGES	MAINTENANCE	MISC.	NET
	-5238.54	-403.10	-375.02	-185.07	-565.70	675.82
10	-4143.39	-320.50	-300.05	-146.08	-450.61	450.52
14	-3157.96	-246.19	-232.04	-111.15	-346.95	240.47

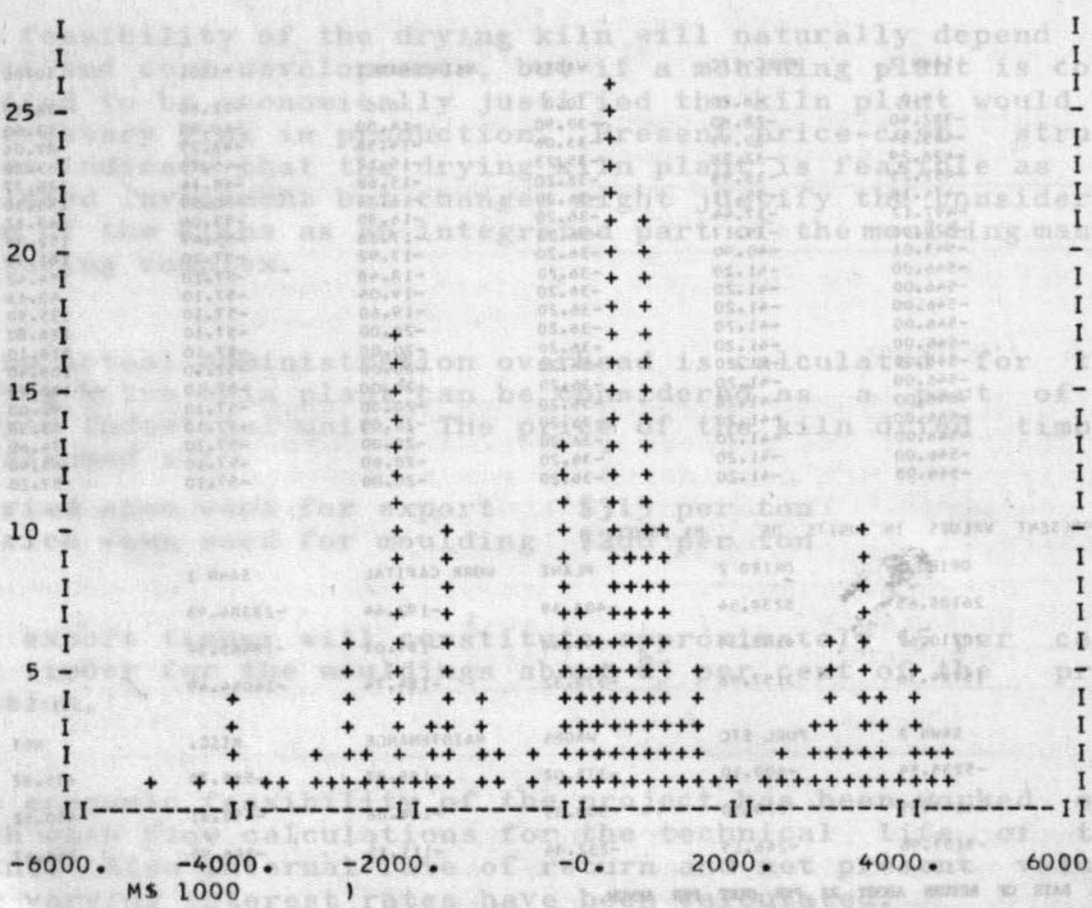
INTERNAL RATE OF RETURN ABOUT 22 PER CENT PER ANNUM

The cash flow and economic evaluations are based on the volumes, cost and prices worked out above, but to introduce the possibility of changing price relations to the calculations, probabilities for price increases and decreases have been included. In consequence the economic evaluations are based on statistical mean-values and not directly on the cost and prices quoted in the project description. The evaluation has been computed on an IBM 370/145.

Table 3.8 indicates the cash flow from the plant in thousand dollars based on the highest probability of the different price assumptions. The net present values of the single items in the cost/income calculation have been calculated at the interest rates 7, 10 and 14 per cent. The internal rate of return (IRR) is indicated at the foot of Table 3.8.

Figure 3.3 shows the distribution of a random sample (200) of the net present values at 10 per cent for different cost/price combinations. The distribution is mainly of theoretical interest, but illustrates the probability for the price assumption in the cash flow calculation. The mean value and the standard deviation is calculated below figure 3.3.

FIGURE 3.3 RANDOM SAMPLE OF 200 NET PRESENT VALUES FOR A RATE OF 10 PER CENT PER ANNUM



DISTRIBUTION HAS A STANDARD DEVIATION OF 2076.96 M$ 1000

ABOUT A MEAN OF 334.53 M$ 1000

3.3 MOULDING PLANT

3.3.1 Market Analysis

The present capacity for moulding manufacturing in Sarawak has been utilised completely during the past year (1973). In isolated cases production has temporarily been below full capacity because of lack of raw materials. Present producers of mouldings in both Sibu and Kuching had several months delivery delay at the end of 1973. The market is entirely export oriented (mainly to United States of America) and seems to be concentrated on light coloured wood products, mainly Ramin.

Thus the unsaturated demand for Ramin mouldings has not been diverted into products manufactured from other species of timber. Initially it could be difficult to turn the existing demand to a changed product, but as only limited efforts have yet been made, a development of the market to include non-ramin mouldings could be anticipated.

When the assumptions for the sawmill were made, two alternatives were given: a mixed hill dipterocarp species based production, and a swamp species based production. The above market considerations are mainly relevant for mixed hill dipterocarp production, but also for the non-ramin swamp timber; new markets for mouldings would also be of importance.

The output of mouldings, which should be marketed outside Sarawak, is estimated at 5 500 tons, distributed on mouldings and dowels as:

- lamellas
- furniture parts
- skirting boards and picture rails
- bannisters
- handles for domestic and industrial implements.

The present export of mouldings and dowels from Sarawak amounts to more than 50 000 tons per year and, though a considerable increase of general moulding capacity can be expected within the next few years, the production volume of the plant described in the present Report could easily be absorbed by a small number of foreign buyers of components for the furniture and construction industries.

As the present market is mainly controlled by foreign buying agents who redistribute to final consumers principally in the United States of America and Europe, a change in the marketing tradition should be considered. The reason for the present difficulties in creating sufficient demand for non-ramin mouldings might be due to the present agent system. The agents are generally uninterested in creating substitutes for products with which they are already supplied by other foreign manufacturers.

About 500 tons of mouldings, will be supplied to the local construction industry, preferably to the pre-fabricated housing plant which would demand certain standard mouldings for windows and interior fittings.

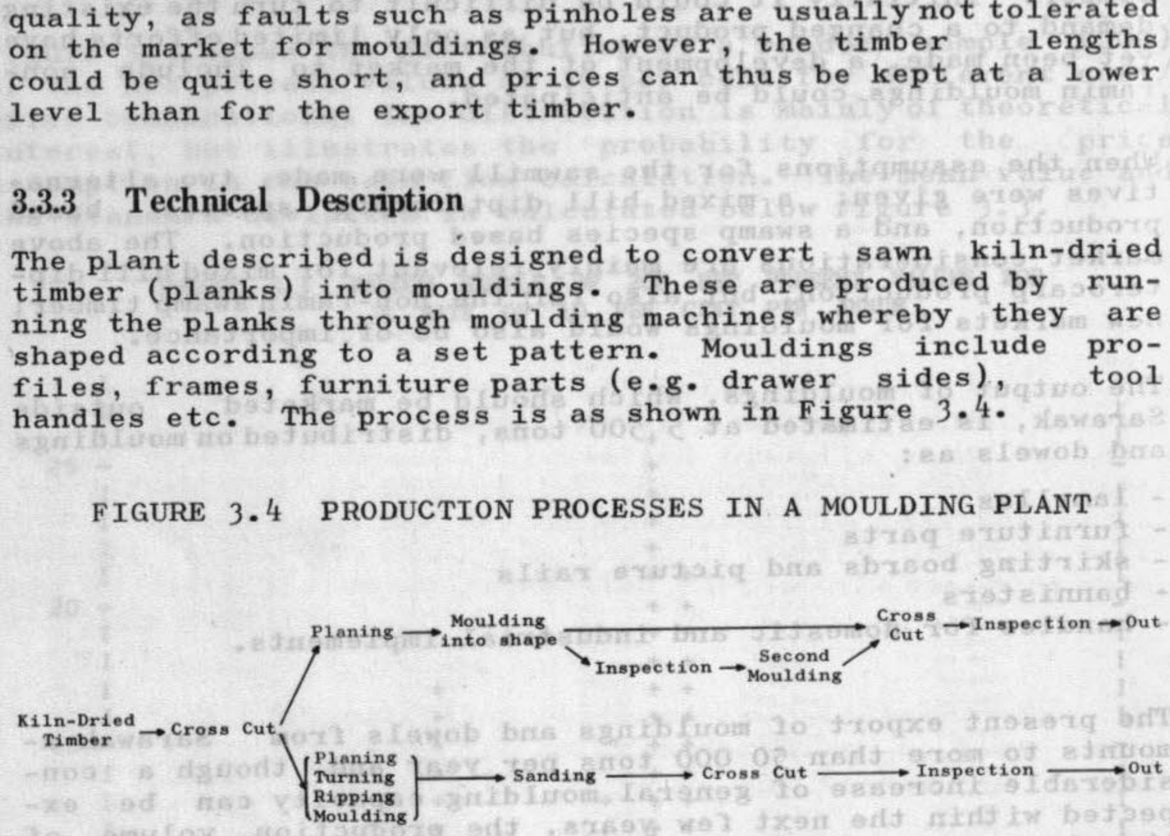
3.3.2 Resource Analysis

The resource base for the moulding plant is the production from the drying kiln plant. The kiln-dried sawn timber intake for the manufacturing of mouldings and dowels is estimated at 10 000 tons per year. With an average 60 per cent conversion rate i.e. for sawn wood into mouldings, this should be sufficient for the planned 6 000 tons production. The sawn wood for the moulding production must be select and of good quality, as faults such as pinholes are usually not tolerated on the market for mouldings. However, the timber lengths could be quite short, and prices can thus be kept at a lower level than for the export timber.

3.3.3 Technical Description

The plant described is designed to convert sawn kiln-dried timber (planks) into mouldings. These are produced by running the planks through moulding machines whereby they are shaped according to a set pattern. Mouldings include profiles, frames, furniture parts (e.g. drawer sides), tool handles etc. The process is as shown in Figure 3.4.

FIGURE 3.4 PRODUCTION PROCESSES IN A MOULDING PLANT



As the requirement for accuracy is usually very high, especially when furniture parts are produced, the machinery and personnel must be able to produce mouldings and dowels of very high quality. The plant includes saws, moulders, conveyors, transport and refuse system. The requirements would be determined by the production factors as shown in the following example.

Sawn timber input: 10 000 tons per year
Average product : 0.75 inches by two inches profile

Tool setting time	:	1.5 hours per shift, 4.5 hours daily
Working time	:	three shifts = 22.5 hours
Effective production	:	22.5 hours - 4.5 hours = 18 hours
Average recovery	:	60 per cent
500 000 cubic feet	:	300 days: 35.4 cubic feet per cubic metre = 47 cubic metre day of timber input by 0.6 = 28.2 cubic meters per day of finished mouldings.
47 cubic metres per day	:	18 hours per day: (0.75 by two inches): 60 minutes per hour = 148 feet per minute of finished mouldings.
Moulding machine requirement	:	(0.75 by two inches) three units, average production speed per unit approximately 50 feet per minute.

The major components of the moulding plant are shown in Table 3.9.

TABLE 3.9 MAJOR COMPONENTS OF THE MOULDING FACTORY (1973 prices)

Items	Dollars
Two moulders (six spindles)	70 000
One moulder (four spindles)	30 000
Three cross cut saws	20 000
Two band resaws (36 inches)	25 000
Sanding equipment	8 000
Conveyors, belts	10 000
Waste conveyor	7 000
Grinding equipment etc.	10 000
Transport equipment	60 000
Total cost	240 000

Different manufacturers of machinery have been considered. The plant indicated in Table 3.9 is based on German made equipment.

The total establishment cost would vary according to location, but the plant is expected to be close to the drying kilns and good transport facilities. Too great distance to the shipping point would naturally reduce the profitability, but as a location close to Bintulu is envisaged, there would probably be no problem.

The total capital requirements will include investment costs and working capital. The total investment in fixed assets will be as seen in Table 3.10.

TABLE 3.10 TOTAL INVESTMENT COSTS IN FIXED ASSETS (dollars)

Land (no costs calculated)	-
Building - office 1 000 square feet at $15 per square foot	15 000
- factory 8 000 square feet at $11 per square foot including storage	88 000
Machinery	240 000
Office equipment	12 000
Total cost	355 000

3.3.4 Operation

The moulding factory is designed for management and operation by local personnel. As there are already several highly efficient plants with good local technical management in Sarawak, supervisors should be available within the country. Training of machine setters and head-operators would be carried out during the construction period.

TABLE 3.11 STAFF REQUIREMENTS AND COSTS FOR A MOULDING PLANT

		Total
Direct Labour		
Superintendant	1 at $12 000	12 000
Mechanics	1 at $10 000	10 000
Tool setter	2 at $ 6 500	13 000
Semi-skilled	10 at $ 4 500	45 000
Unskilled (female)	20 at $ 2 500	50 000
Total for 1 shift	34	130 000
Total for 3 shifts	102	390 000
Management		
Manager	1 at $18 000	18 000
Accountant	1 at $12 000	12 000
Clerks	2 at $ 3 000	6 000
		36 000
Total salaries		426 000

Other production costs include raw materials, power, maintenance etc. The average sawn kiln-dried timber price is $260 per ton.

Power is calculated at $0.09/kWh.

Total power requirements are estimated at 170 kWh on 18 hours in 300 days, in total $83 000 at full capacity or $8.30 per ton timber intake.

Maintenance of equipment is calculated at eight per cent of equipment costs, in total $19 000 or $3.15 per ton. Insurance is estimated at 2.5 per cent of plant investment, in total $9 000.

The lifetime of the plant is calculated at 20 years. But after 10 years of operation 60 per cent of plant equipment should be renewed. This covers mainly moulding machinery.

3.3.5 Economic Evaluation

The feasibility of the moulding production depends on price and cost development. But with an increasing global tendency towards restrictions on log export from the raw material producing countries, an early established remanufacturing plant should have good market and product price prospects. The moulding factory in this case has been assumed to have a separate administration, but as it has been kept at a low level the management cost should not be much higher than in the case of full integration with kilns and sawmill.

The moulding plant, as in the previous analyses, has been evaluated under the assumption of constant price relation. The finished moulding products have been assumed to obtain selling prices ex factory at:

	$/ton
- mouldings for export (including packing)	605
- moulding for local market	550

The economic feasibility of the project has been worked out with cash flow calculations for the technical life of the plant. Also internal rate of return and net present values for varying interest rates have been calculated.

The cash flow and economic evaluations are based on the volumes, cost and prices worked out above, but to introduce the possibility of changing price relations to the calculations, probabilities for price increases and decreases have been included. In consequence the economic evaluations are based on statistical mean-values and not directly on the cost and prices quoted in the project description. The evaluation has been computed on an IBM 370/145.

TABLE 3.12 MEAN COSTS AND BENEFITS (THOUSAND DOLLARS)

MOULDING PLANT
CONSTRUCTION YEAR: 1975
FIRST YEAR OF OPERATION: 1976
MAXIMUM CAPACITY CIRCA 10 000 TONS INTAKE PER ANNUM (3 SHIFTS)
FULL CAPACITY: 1979

YEAR	MOULDING 1	MOULDING 2	PLANT	WORK CAPITAL	SAWN TIMBER
1975	0.0	0.0	-355.00	-273.00	0.0
1976	194.00	2445.70	0.0	-242.00	-1883.70
1977	205.64	2592.44	0.0	-82.40	-1996.72
1978	217.28	2739.18	0.0	-56.60	-2109.74
1979	228.92	2885.92	0.0	-31.00	-2222.76
1980	240.56	3032.67	0.0	0.0	-2335.79
1981	252.20	3179.41	0.0	0.0	-2448.81
1982	263.84	3326.15	0.0	0.0	-2561.83
1983	275.48	3472.89	0.0	0.0	-2674.85
1984	278.40	3493.90	0.0	0.0	-2691.00
1985	278.40	3493.90	-144.00	0.0	-2691.00
1986	278.40	3493.90	0.0	0.0	-2691.00
1987	278.40	3493.90	0.0	0.0	-2691.00
1988	278.40	3493.90	0.0	0.0	-2691.00
1989	278.40	3493.90	0.0	0.0	-2691.00
1990	278.40	3493.90	0.0	0.0	-2691.00
1991	278.40	3493.90	0.0	0.0	-2691.00
1992	278.40	3493.90	0.0	0.0	-2691.00
1993	278.40	3493.90	0.0	0.0	-2691.00
1994	278.40	3493.90	0.0	0.0	-2691.00
1995	278.40	3493.90	0.0	0.0	-2691.00

YEAR	FUEL ETC	WAGES	MAINTENANCE	MISC.	TOTAL
1975	-14.40	0.0	0.0	-52.10	-694.50
1976	-59.80	-371.70	-13.00	-73.30	-3.80
1977	-63.39	-397.72	-13.52	-77.70	166.63
1978	-66.98	-423.74	-14.04	-82.10	203.27
1979	-70.56	-438.90	-14.56	-86.49	250.56
1980	-74.15	-438.90	-15.08	-90.89	318.42
1981	-77.74	-438.90	-15.60	-93.90	356.66
1982	-81.33	-438.90	-16.12	-93.90	397.91
1983	-84.89	-438.90	-16.64	-93.90	439.19
1984	-85.40	-438.90	-17.16	-93.90	445.94
1985	-85.40	-438.90	-17.68	-93.90	301.42
1986	-85.40	-438.90	-18.20	-93.90	444.90
1987	-85.40	-438.90	-18.72	-93.90	444.38
1988	-85.40	-438.90	-19.00	-93.90	444.10
1989	-85.40	-438.90	-19.00	-93.90	444.10
1990	-85.40	-438.90	-19.00	-93.90	444.10
1991	-85.40	-438.90	-19.00	-93.90	444.10
1992	-85.40	-438.90	-19.00	-93.90	444.10
1993	-85.40	-438.90	-19.00	-93.90	444.10
1994	-85.40	-438.90	-19.00	-93.90	444.10
1995	-85.40	-438.90	-19.00	-93.90	444.10

MEAN PRESENT VALUES IN UNITS OF M$ 1000

RATE (%)	MOULDING 1	MOULDING 2	PLANT	WORK CAPITAL	SAWN TIMBER
7	2664.11	33512.62	-428.20	-640.99	-25811.57
10	2106.49	26505.69	-410.52	-624.80	-20414.80
14	1604.88	20200.93	-393.84	-605.24	-15558.86

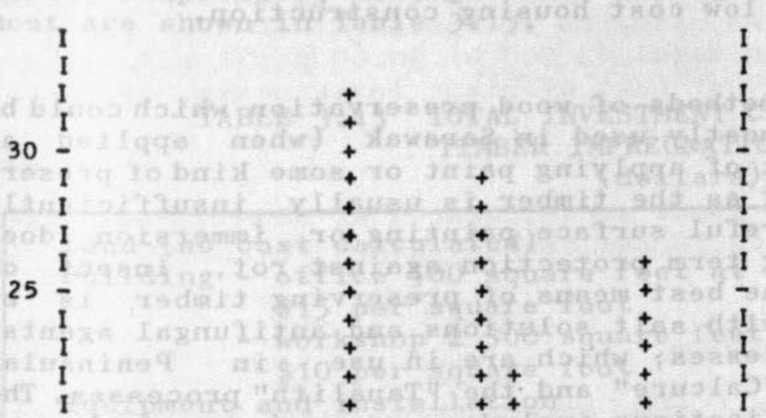
RATE (%)	FUEL ETC	WAGES	MAINTENANCE	MISC.	NET
7	-833.67	-4538.59	-173.05	-996.05	2754.62
10	-662.38	-3630.11	-136.42	-803.61	1929.54
14	-508.26	-2806.04	-103.65	-629.56	1200.34

INTERNAL RATE OF RETURN > 25.0 %

Table 3.12 indicates the cash flow from the plant in thousand dollars based on the highest probability of the different price assumptions. The net present values of the single items in the cost/income calculation have been calculated at the interest rates 7, 10 and 14 per cent. The internal rate of return (IRR) is indicated at the foot of Table 3.12, and where the IRR is above 25 per cent it is not specified further.

Figure 3.5 shows the distribution of a random sample (200) of the net present values at 10 per cent for different cost/price combinations. The distribution is mainly of theoretical interest, but illustrates the probability for the price assumption in the cash flow calculation. The mean value and the standard deviation is calculated below figure 3.5.

FIGURE 3.5 RANDOM SAMPLE OF 200 NET PRESENT VALUES FOR A RATE OF 10 PER CENT PER ANNUM



DISTRIBUTION HAS A STANDARD DEVIATION OF 3275.18 M$ 1000

ABOUT A MEAN OF 2068.64 M$ 1000

3.4 TIMBER IMPREGNATION PLANT

Preservation of timber in the past has not been very efficient in Sarawak. One of the reasons for this is that formerly only very resistant timbers were used for construction purposes. The durability of timber like belian and selangan batu made preservation measures unnecessary. When construction development increased only mediocre preservation methods were applied to the less durable timbers, which now constitute the main materials for housebuilding. Although treatment with creosote and other wood preservatives is often prescribed in building specifications, the use of efficient preservation is still very limited. Furthermore non approved preservation liquids like waste oil are often used as substitute for more expensive products.

As it is of major importance to protect construction timber, new ways should be introduced to improve the preservation treatment. This is especially the case when lighter dimensions are introduced for low cost housing construction.

There are various methods of wood preservation which could be applied. The one mostly used in Sarawak (when applied as prescribed) is that of applying paint or some kind of preservation liquid. But as the timber is usually insufficiently seasoned even a careful surface painting or immersion does not afford any long term protection against rot, insect or fungal attacks. The best means of preserving timber is by full impregnation with salt solutions and antifungal agents. The best known processes, which are in use in Peninsular Malaysia, are the "Calcure" and the "Tanalith" processes. The preservation specifications include a vacuum/pressure impregnation with a minimum dry salt retention of 0.35 pound per cubic foot of timber. This corresponds to the directives worked out by the Federal Land Development Authority (FELDA) for treatment of all timber, except heavy hardwoods, for housing construction.

3.4.1 Market Analysis

The general market in Sarawak for pressure treated timber should be extensive. However, because of undue savings by less responsible contractors and developers the actual demand for impregnated timber is reduced. The timber impregnation plant described here does not intend to cover demand from the general market. The capacity of the plant, and its production, is assumed to be taken up mainly by the pre-fabricated housing plant described in Section 3.5 following. The only sales to the general market would be as a regulating factor to the capacity. Consequently the plant capacity of an annual input of 5 000 tons sawn construction timber is entirely decided by the expected market for the pre-fabricated housing plant.

3.4.2 Resource Analysis

The resource base for the impregnation plant is the output from the recommended sawmill. An annual input of varying qualities of merchantable sawn timber is assumed. The supply is considered to be constant and storage facilities for raw materials should be limited.

3.4.3 Technical Description

The capacity of the plant is designed to be about 5 000 tons per year or about 400 to 450 tons per month. The plant would be designed to operate the full cell process whereby air is removed under vacuum and preservatives are forced into the wood under pressure. The required pressure to be applied is about 200 pounds per square inch. The annual output of 5 000 tons requires two retorts of six feet internal diameter by 30 feet long, each having a capacity of 400 cubic feet per charge. The total capital requirements, which include retorts, compressor, mixing tanks, storage and handling equipment are shown in Table 3.13.

TABLE 3.13 TOTAL INVESTMENT COSTS FOR TIMBER IMPREGNATION PLANT (dollars)

Land (no cost calculated)	-
Building - office 500 square feet at $15 per square foot	7 500
- workshop 2 500 square feet at $10 per square foot	25 000
Equipment and installation	150 000
Office, miscellaneous	10 000
Transport equipment	35 000
Total	227 000

3.4.4 Operation

The timber impregnation plant would be operated by local personel. The process is uncomplicated and no special skilled labour is required. Also no training is considered necessary.

The plant will require the following staffing:

			$
Superintendant	1	at $12 000	12 000
Assistants	2	at $ 7 000	14 000
Labourers	10	at $ 3 000	30 000
Total	13		56 000

No management is considered necessary as production should be closely tied to the pre-fabricated housing plant.

Other production costs include raw materials, power, water and maintenance. The average sawn timber price for the impregnation plant is $220 per ton.

The cost of wood preservation is assumed on the basis of a dry salt retention of 0.35 pounds per cubic foot. Different impregnation chemicals can be used; the present calculations are based on the "Tanalith" CT106 wood preservative which cif Miri costs about $750 per drum (of 0.25 tons = 550 pounds). If a five per cent wastage of wood preservative is anticipated, the cost of chemicals per ton of treated timber would be about $24, or $120 000 in total per year at full production.

Power and water consumption is calculated at $8 000 per year or $1.60 per ton. Maintenance of equipment is two per cent of equipment cost in total $3 000 or $0.60 per ton. Insurance is estimated at 2.2 per cent of plant investments, in total $5 000.

The lifetime of the plant is calculated at 20 years, but after 10 years of operation 30 per cent of plant equipment should be renewed.

3.4.5 Economic Evaluation

The feasibility of a timber impregnation plant is difficult to analyse as no actual market exists in Sarawak for pressure treated timber. As no geninue alternative preservation method is in use, no practical cost alternatives can be used. The value of preserved timber could theoretically be calculated by discounting the value of the extended lifetime of the finished construction, but this is hardly possible. The only indication of impregnation cost which can possibly be applied is that scheduled by PWD (1968). According to this schedule the cost of impregnation should be:

	dollars/ton
- traditional creosote treatment (three pounds per cubic feet)	45
- vacuum/pressure treatment (0.35 pounds per cubic feet)	60

Considering the difference between the present and 1968 price levels a treatment price for this plant of $60 can be considered realistic. The selling price of the pressure impregnated timber would thus be $280 per ton.

The economic feasibility of the project has been worked out with cash flow calculations for the technical life of the

TABLE 3.14 MEAN COSTS AND BENEFITS (THOUSAND DOLLARS)

TIMBER IMPREGNATION PLANT
CONSTRUCTION YEAR: 1975
FIRST YEAR OF OPERATION: 1976
MAXIMUM CAPACITY CIRCA 5 000 TONS PER ANNUM (1 SHIFT)
FULL CAPACITY: 1979

YEAR	IMPRG.TIMBER	PLANT	WORK CAPITAL	SAWN TIMBER	CHEMICALS
1975	0.0	-228.00	-41.40	0.0	0.0
1976	1029.00	0.0	-25.60	-808.70	-86.60
1977	1090.74	0.0	-20.60	-857.22	-91.80
1978	1152.48	0.0	-10.20	-905.74	-96.99
1979	1214.22	0.0	0.0	-954.27	-102.19
1980	1275.96	0.0	0.0	-1002.79	-107.38
1981	1337.70	0.0	0.0	-1051.31	-112.58
1982	1399.44	0.0	0.0	-1099.83	-117.78
1983	1461.18	0.0	0.0	-1148.35	-122.97
1984	1470.00	0.0	0.0	-1155.00	-123.60
1985	1470.00	-45.00	0.0	-1155.00	-123.60
1986	1470.00	0.0	0.0	-1155.00	-123.60
1987	1470.00	0.0	0.0	-1155.00	-123.60
1988	1470.00	0.0	0.0	-1155.00	-123.60
1989	1470.00	0.0	0.0	-1155.00	-123.60
1990	1470.00	0.0	0.0	-1155.00	-123.60
1991	1470.00	0.0	0.0	-1155.00	-123.60
1992	1470.00	0.0	0.0	-1155.00	-123.60
1993	1470.00	0.0	0.0	-1155.00	-123.60
1994	1470.00	0.0	0.0	-1155.00	-123.60
1995	1470.00	0.0	0.0	-1155.00	-123.60

YEAR	FUEL ETC	WAGES	MAINTENANCE	MISC.	TOTAL
1975	-2.00	0.0	0.0	-7.30	-278.70
1976	-7.20	-48.50	-2.00	-18.90	31.50
1977	-7.63	-51.89	-2.08	-20.03	39.48
1978	-8.06	-55.29	-2.16	-21.17	52.86
1979	-8.20	-57.80	-2.24	-22.30	67.22
1980	-8.20	-57.80	-2.32	-23.44	74.03
1981	-8.20	-57.80	-2.40	-24.57	80.84
1982	-8.20	-57.80	-2.48	-25.70	87.65
1983	-8.20	-57.80	-2.56	-26.84	94.46
1984	-8.20	-57.80	-2.64	-27.20	95.56
1985	-8.20	-57.80	-2.72	-27.20	50.48
1986	-8.20	-57.80	-2.80	-27.20	95.40
1987	-8.20	-57.80	-2.88	-27.20	95.32
1988	-8.20	-57.80	-2.96	-27.20	95.24
1989	-8.20	-57.80	-3.00	-27.20	95.20
1990	-8.20	-57.80	-3.00	-27.20	95.20
1991	-8.20	-57.80	-3.00	-27.20	95.20
1992	-8.20	-57.80	-3.00	-27.20	95.20
1993	-8.20	-57.80	-3.00	-27.20	95.20
1994	-8.20	-57.80	-3.00	-27.20	95.20
1995	-8.20	-57.80	-3.00	-27.20	95.20

MEAN PRESENT VALUES IN UNITS OF M$ 1000

RATE (%)	IMPRG.TIMBER	PLANT	WORK CAPITAL	SAWN TIMBER	CHEMICALS
7	14099.95	-250.88	-91.64	-11079.95	-1186.11
10	11151.89	-245.35	-89.36	-8763.45	-938.17
14	8499.25	-240.14	-86.59	-6679.06	-715.07

RATE (%)	FUEL ETC	WAGES	MAINTENANCE	MISC.	NET
7	-87.33	-596.44	-26.81	-267.20	513.58
10	-70.33	-476.86	-21.11	-212.77	334.48
14	-54.90	-368.42	-16.01	-163.81	175.24

INTERNAL RATE OF RETURN ABOUT 22 PER CENT PER ANNUM

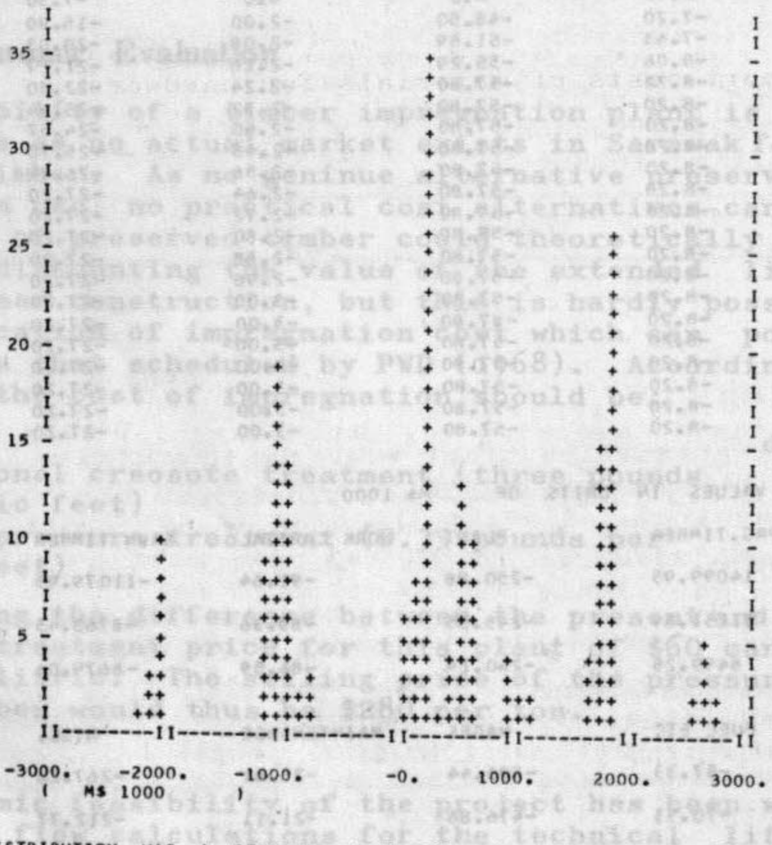
plant. Also internal rate of return and net present values for varying interest rates have been calculated.

The cash flow and economic evaluations are based on the volumes, cost and prices worked out above, but to introduce the possibility of changing price relations to the calculations, probabilities for price increases and decreases have been included. In consequence the economic evaluations are based on statistical mean-values and not directly on the cost and prices quoted in the project description. The evaluation has been computed on an IBM 370/145.

Table 3.14 indicates the cash flow from the plant in thousand dollars based on the highest probability of the different price assumptions. The net present values of the single items in the cost/income calculation have been calculated at the interest rates 7, 10 and 14 per cent. The internal rate of return (IRR) is indicated at the foot of Table 3.14.

Figure 3.6 shows the distribution of a random sample (200) of the net present values at 10 per cent for different cost/price combinations. The distribution is mainly of theoretical interest, but illustrates the probability for the price assumption in the cash flow calculation. The mean value and the standard deviation is calculated below.

FIGURE 3.6 RANDOM SAMPLE OF 200 NET PRESENT VALUES FOR A RATE OF 10 PER CENT PER ANNUM



DISTRIBUTION HAS A STANDARD DEVIATION OF 1264.74 M$ 1000

ABOUT A MEAN OF 310.73 M$ 1000

3.5 PRE-FABRICATED HOUSING PLANT

The concept of manufacturing housing components in a factory for later assembly on the building site is not new. Most construction activity is divided between workshop and on-site preparations. Consequently, pre-fabrication of housing is only a matter of the extent to which construction is undertaken in the workshop.

To make possible the pre-fabrication of components for houses in a factory, a standardised production line must be planned. Standard building components and units should be designed to fit a module system in such a way that, even if different types of houses are produced in the plant, the basic parts will always be the same. It is by standardising production in this way that costs can be reduced, through savings in materials and labour.

3.5.1 Market Analysis

The demand for houses depends on the present number of acceptable houses, the need for additional housing facilities for present and future population, and the future need for replacement of old dwellings. The future market for pre-fabricated houses depends on the same factors, only it seems advisable to concentrate on a certain part of the market for new houses. The housing market can be divided according to two criteria:-

- houses of different standard;
  (low income, medium, luxury, etc.)
- houses made from different building materials.
  (wood, concrete/brick, etc.)

The housing standard depends on the income of the potential buyers of the houses; the price or rent of houses; and the preferences of the house dwellers. As a first step it is therefore necessary to consider the income distribution in order to estimate the composition of the standards of the total demand. The family incomes in Sarawak have been divided into four groups in 1970 and 1990 and they are shown in Table 3.15.

Family income is related to housing type according to the following criteria:

- people will pay a maximum of 15 per cent of their annual income for housing.
- the annual housing cost is 10 per cent of the total building costs.
- the housing costs will be borne by the family out of its annual income, i.e. no subsidies are considered.

TABLE 3.15 DISTRIBUTION OF FAMILY INCOME 1970 AND 1990

Income group	1970			1990		
	Average income $	Distribution urban areas per cent	rural	Average income $	Distribution urban areas per cent	rural
Low	2 500	50	90	4 500	40	70
Lower middle	5 500	35	10	9 500	35	30
Higher middle	9 000	10	-	15 000	20	-
High	20 000	5	-	30 000	5	-

The acceptable building costs for the different income groups 1975 to 1980 would then be approximately:-

	Dollars
Low standard	4 500
Lower middle standard	9 000
Higher middle standard	15 000
Higher standard	30 000

Considering the present pattern for housing demand, it can be assumed that the majority of the low and lower income houses will be constructed of wood-materials, while the higher income standards will be mainly brick/concrete houses; although it might be questioned as to whether mixed stone/wood houses would be better suited to the local climate.

For a pre-fabricated housing plant based on the local timber industry, it therefore seems appropriate to concentrate its housing production on the low income standards. It could be added that this is also the socially most important part of the housing market as cost reductions in this price region standard group are relatively more important for the general well being of the people.

The above market considerations are all based on the local market; the structure of the export market is entirely different. It is, however, assumed that the pre-fabricated housing plant should be based on the domestic market, and only when techniques and ability to compete internationally has been ascertained should the plant be expanded to allow for the production of specific export types. This does not prevent a possible export of the low cost types designed for the local market, as these types might be a suitable introduction to foreign buyers of Sarawak pre-fabricated houses; but primarily, it only means that the production of the plant should be designed for and based on local demand. The total demand for new houses has been calculated using the following criteria:-

- the growth of population in 1975 to 1980 will be 2.8 per cent per year in Sarawak and 4.0 per cent in the Study Area.

- the ratio between rural and urban population will change gradually (in 1970: 75:25; in 1990: 60:64)
- the average family size will in the future be 5.2 persons in urban areas and 5.6 persons in rural areas.
- a housing renewal corresponding to 2.5 per cent per year of all existing houses constructed before 1960 (depending on location) will be undertaken.

If the pre-fabricated housing plant would initially concentrate its production on mass produced low cost houses for the lowest income group, the total demand pattern for these types in 1975 to 1980 will be:-

1975-1980	Sarawak	Study Area
Annual demand for low cost houses	6 000 to 6 500	800 to 1 000

After 1980 the annual demand will be increased by four to six per cent per year, but as the pre-fabricated housing plant is expected to reach full capacity before 1980, and as the market share should not decrease by more than the estimated growth in total demand, no detailed estimates have been worked out for the years after 1980.

The Study Area has been considered as the primary market for the pre-fabrication plant which, located in the Bintulu region, would be able to cover the Study Area and deliver the finished product up to a maximum road transport distance of 150 miles from Bintulu. The present capacity for house building in the Study Area is probably about 400 to 500 units per year, covering all types from low cost to luxury standard.

With the expected increase in the construction of commercial and government building, the total capacity of the existing contractors will probably not exceed 800 to 900 housing units per year - of which 600 units will be demanded by the higher income groups. The contractor capacity left for low cost construction will thus be about 200 to 300 units. Out of the estimated demand for low cost houses of 800 to 1 000 units, about 600 units will probably have to be covered from direct outside contractor capacity, or an increase in the local capacity which will have to be covered indirectly by outside capacity.

Besides the ordinary demand assumed above, the construction of a LNG plant at Bintulu would demand housing for construction workers. During the peak construction period more than 3 500 workers will be employed at the LNG plant site; at least 2 000 of these workers will be short term immigrant labourers. If the labourers are settled in low cost houses, allocating sleeping and cooking facilities for six to eight workers per unit, the demand for low cost houses will be increased by 150 per year in 1976 to 1977.

According to the development plans a limited number of big organisations will demand a large part of the total requirement for low cost houses in 1975 to 1980. This means that if contracts can be secured with these organisations a substantial part of the total plant capacity will be covered. This should be possible as single local contractors will find it difficult to meet the demand for large numbers of settlers' and other low cost houses. The organisation demand has been estimated as shown in Table 3.16.

TABLE 3.16 DEMAND FOR HOUSES BY DEVELOPMENT ORGANISATIONS 1975 to 1980 (in units)

Sarawak Land Development Board:	
Subis development (not yet contracted)	
Settlers and workers	550
Junior management	25
Other SLDB development in the Study Area	
Settlers and workers	2 125
Junior management	75
Ministry of Agriculture:	
Agricultural Development Unit	
Junior staff	175
Two to three large private estates:	
Workers	450
Junior management	25
Sarawak Shell Berhad for LNG:	
Construction labour quarters	300
Total organisation demand for low cost houses (1975-1980)	3 725
Average per year 1975-1980	600 - 650

According to the projections of the market shown in Table 3.20 in the Study Area and the rest of Sarawak, the following market shares have been assumed:

Study Area		=	600 units
Rest of Sarawak	30 per cent	=	200 units
			800 units

The demand from the rest of Sarawak is assumed to be mainly from Third and Fifth Divisions.

Based on the market possibilities a pre-fabricated housing plant should be established with a capacity of 800 units per year, producing at about 70 per cent capacity in the first year of full operation and 95 per cent capacity thereafter.

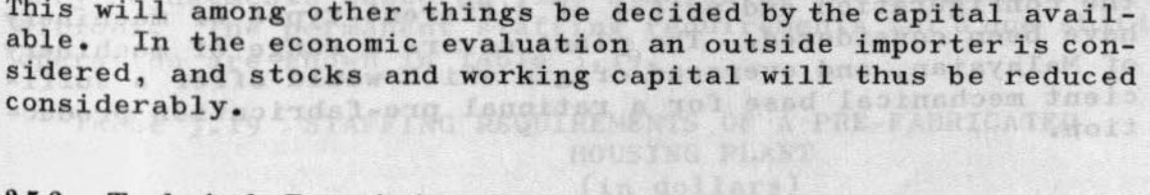
3.5.2 Resource Analysis

The main resource base for the pre-fabricated housing plant will be impregnated construction timber from the impregnation plant. Other wood raw materials such as for instance plywood should be contracted to specification from a Sarawak plywood mill. Raw materials such as cement, roofing material, insulation, nails, screws, pipes etc. should be on special contract with a major hardware importer. Since Sarawak Economic Development Corporation (SEDC) is entering the market for wholesale hardwares they might be a possible supplier. But if no satisfactory arrangement as to hardware supply can be made, an import by the pre-fabrication plant itself might be possible as the production capacity indicates that sufficient quantities will be required to sustain an import section. This will among other things be decided by the capital available. In the economic evaluation an outside importer is considered, and stocks and working capital will thus be reduced considerably.

3.5.3 Technical Description

The plant for the pre-fab houses would manufacture housing elements to the stage of completion which is most feasible when all stages of the manufacturing process, the transport to site, and assembly are considered. The entire process is planned to be carried out by the pre-fabrication factory including specialised assembly teams constantly employed on the housing sites. The process is illustrated in Figure 3.6.

FIGURE 3.6 PRODUCTION PROCESSING IN A PRE-FABRICATED HOUSING PLANT



Requirements for accuracy will be relatively high and to avoid delays and corrections during later parts of the production process, machinery and personnel must be well adjusted. The pre-fabrication plant comprises the major components shown in Table 3.17.

TABLE 3.17 MAJOR COMPONENTS REQUIREMENTS OF A PRE-FABRICATED HOUSING PLANT (1973 prices) (in dollars)

1 cross cut saw	2 000
1 circular saw	2 500
1 multi rip saw	13 000
2 16 inch jointer	8 000
1 planer (3 side)	15 000
2 planers (1 side)	12 000
2 mortises	5 000
1 band saw	4 500
15 working benches	3 000
Hand tools, tool-shop	5 000
Handling equipment	30 000
Waste disposal system	15 000
Total plant equipment	115 000

During the cost calculation of the plant shown in Table 3.17, the configuration and prices of different types of machinery have been considered. The plant covers a range of machinery of Malaysian, and overseas origin which would offer a sufficient mechanical base for a rational pre-fabrication production.

The intake of raw materials will have no important effect on the location of the plant because an efficient transport division for finished products will be necessary. However, a location next to the impregnation plant is envisaged, thus reducing transport costs of materials for hardware.

The transport of the modules to the building site has in the calculations been based on road transport, and a good road access to the plant will therefore be necessary. Should the plant be located close to river transport facilities, a second barge based transport division might be feasible. But as the river transport investment must be based on exact knowledge of markets close to the water-ways, this mode of transport has not been included in the analysis.

Supply of electricity is assumed to be from SESCO, consequently no generators are included in the investment costs. The total capital requirements will include investment costs and working capital. The total investments in fixed assets are shown in Table 3.18.

3.5.4 Operation

The pre-fabrication plant is designed for local management and operation. But as the manufacturing and assembly technique is new to Sarawak an intensive period of training during

TABLE 3.18 TOTAL INVESTMENT IN FIXED ASSETS
(in dollars)

Land (no cost calculated)	
Building - office	15 000
- factory	200 000
Equipment	115 000
Vehicles - two lorries at 30 000	60 000
Office equipment, miscellaneous	15 000
Total fixed assets	405 000

Working capital is specified in a later section.

the running-in period of the production is assumed. At least two highly qualified experts would have to be engaged together with the key personnel of plant and assembly section six months before full production commences. The training under these supervising experts should continue during the first six months of operation. After this only one supervisor should be necessary in another year of production to carry out necessary adjustments based on time studies of the local work conditions. The permanent staffing requirements for a one shift operation are shown in Table 3.19.

TABLE 3.19 STAFFING REQUIREMENTS OF A PRE-FABRICATED HOUSING PLANT
(in dollars)

Direct Labour		
Plant		
Technical manager	1 at $18 000	18 000
Assistant	1 at $12 000	12 000
Technicians (tool settlers, mechanicles)	3 at $10 000	30 000
Skilled workers	5 at $ 5 000	25 000
Assemblers (semi-skilled)	5 at $ 4 000	20 000
Unskilled workers	10 at $ 3 000	30 000
Sub total direct labour	25	135 000
Site		
Site superintendant	1 at $ 8 000	8 000
Assembling labourers	20 at $ 3 000	60 000
Sub total site labour	21	68 000
Management		
Technical manager (of. plant)		
Office manager	1 at $15 000	15 000
Accountant	1 at $10 000	10 000
Clerks, typists	3 at $ 3 000	9 000
Draughtsman	1 at $ 3 000	3 000
Sub total management	6	37 000
Total employment	52	240 000

The figures in Table 3.19 represent the salary costs during full operation and will be reduced during the training and construction period. In the six months prior to full operation the personnel and salary would be:-

Number	Salary $
2 experts	70 000
1 technical manager	9 000
1 assistant	6 000
2 technicians	10 000
3 skilled	8 000
1 site superintendant	4 000
4 assembling labourers	6 000
2 management	7 000
Total pre-operation salaries	120 000

Other production costs include raw materials, power and maintenance. The input of raw materials will depend on the final design of the housing types, which should be worked out after very careful studies by experienced architects and engineers. The type should be familiar to the future users and yet improve the housing standards with the best utilisation of labour and materials. The calculation in this analysis is based on a housing type related to the one used by FELDA for settler houses in Peninsular Malaysia and Sabah and a revised type designed by SLDB.

The requirements for impregnated timber for each unit has been estimated at six tons. As the cost is $280 per ton, total timber costs amount to $1 680 per unit. This includes wastage.

Roofing is calculated at	$300 per unit
Other hardware	$500 per unit
On site costs (including concrete)	$160 per unit
Transport (average 2 x 100 miles, 7 tons, operation only)	$ 15 per unit
Other raw materials total	$975 per unit

Power is calculated at $0.09 kWh. Total power requirements at full capacity is estimated at 75 kW and the cost per unit $20 (i.e. 75 kWh by eight hours by $0.09/kWh by 300 days divided by 900 units). Maintenance of equipment is calculated at eight per cent of equipment cost in total $9 000 or $11.50 per unit. Insurance is estimated at 2.5 per cent of plant investment, in total $10 000 per year. Labour insurance is estimated at five per cent of total direct labour cost, in total $9 500.

The lifetime of the plant is calculated at 20 years but after 10 years of operation 50 per cent of plant equipment should be renewed. Transport equipment should be replaced at every five years of operation.

3.5.5 Economic Evaluation

The evaluation of the pre-fab plant depends on the price development of the production factors. As the raw materials will be both local and externally produced, changes in price relations might necessitate adjustments in the production process.

Price fluctuations on raw materials would necessarily have to be reflected immediately in the house prices. To reach a secure base for contracting it is proposed to tie pre-fabricated building contracts to a construction cost index, which should be worked out or controlled by the Department of Statistics or other source. By basing the house price on an index, unnecessary future price trends speculation could be avoided. This means that when the price of one unit is $3 900, based on the costs and income levels quoted in this analysis the index figure for this price is 100. If prices rise to such an extent that the authorised index rises to 110, the house price would automatically be $4 300 according to the changed index figure.

The pre-fab house at a price of $4 500 would be the best and cheapest solution for low cost housing available in Sarawak to date (March 1974) - the pre-fabricated house would thus be in a very strong competitive position. By attaching the house price to the proposed index, planning would be facilitated for both producers and consumers and the speculation in price trends avoided to the benefit of the social economy.

The economic feasibility of the project has been worked out with cash flow calculations for the technical life of the plant. Also internal rate of return and net present values for varying interest rates have been calculated.

The cash flow and economic evaluations are based on the volumes, cost and prices worked out above, but to introduce the possibility of changing price relations to the calculations, probabilities for price increases and decreases have been included. In consequence the economic evaluations are based on statistical mean-values and not directly on the cost and prices quoted in the project description. The evaluation has been computed on an IBM 370/145.

Table 3.20 indicates the cash flow from the plant in thousand dollars based on the highest probability of the different price assumptions. The net present values of the single items in the cost/income calculation have been calculated at the interest rates 7, 10 and 14 per cent. The internal rate of return (IRR) is indicated at the foot of Table 3.20, and where the IRR is above 25 per cent it is not specified further.

TABLE 3.20 MEAN COSTS AND BENEFITS (THOUSAND DOLLARS)

PRE-FABRICATED HOUSING PLANT
CONSTRUCTION YEAR: 1975
FIRST YEAR OF OPERATION: 1976
MAXIMUM CAPACITY 800 UNITS PER ANNUM
FULL CAPACITY: 1979

YEAR	HOUSE UNITS	PLANT	WORK CAPITAL	MPRG.TIMBER	OTHER MATR.
1975	0.0	-405.00	-329.60	0.0	0.0
1976	2260.60	0.0	-195.80	-1029.00	-562.40
1977	2396.23	0.0	-118.40	-1090.74	-596.14
1978	2531.87	0.0	-61.80	-1152.48	-629.89
1979	2667.51	0.0	-25.80	-1214.22	-663.63
1980	2803.14	-60.00	0.0	-1275.96	-697.38
1981	2938.78	0.0	0.0	-1337.70	-731.12
1982	3074.41	0.0	0.0	-1399.44	-764.86
1983	3210.05	0.0	0.0	-1461.18	-798.61
1984	3229.20	0.0	0.0	-1470.00	-803.40
1985	3229.20	-118.00	0.0	-1470.00	-803.40
1986	3229.20	0.0	0.0	-1470.00	-803.40
1987	3229.20	0.0	0.0	-1470.00	-803.40
1988	3229.20	0.0	0.0	-1470.00	-803.40
1989	3229.20	0.0	0.0	-1470.00	-803.40
1990	3229.20	-60.00	0.0	-1470.00	-803.40
1991	3229.20	0.0	0.0	-1470.00	-803.40
1992	3229.20	0.0	0.0	-1470.00	-803.40
1993	3229.20	0.0	0.0	-1470.00	-803.40
1994	3229.20	0.0	0.0	-1470.00	-803.40
1995	3229.20	0.0	0.0	-1470.00	-803.40

YEAR	FUEL ETC	WAGES	MAINTENANCE	MISC.	TOTAL
1975	0.0	0.0	0.0	-25.20	-759.80
1976	-11.40	-212.50	-6.00	-70.00	173.50
1977	-12.08	-227.37	-6.24	-74.20	271.05
1978	-12.77	-242.25	-6.48	-78.40	347.81
1979	-13.45	-249.00	-6.72	-82.60	412.08
1980	-14.14	-249.00	-6.96	-86.80	412.91
1981	-14.82	-249.00	-7.20	-91.00	507.94
1982	-15.50	-249.00	-7.44	-95.20	542.97
1983	-16.10	-249.00	-7.68	-99.40	578.09
1984	-16.40	-249.00	-7.92	-100.20	582.28
1985	-16.40	-249.00	-8.16	-100.20	464.04
1986	-16.40	-249.00	-8.40	-100.20	581.80
1987	-16.40	-249.00	-8.64	-100.20	581.56
1988	-16.40	-249.00	-8.88	-100.20	581.32
1989	-16.40	-249.00	-9.00	-100.20	581.20
1990	-16.40	-249.00	-9.00	-100.20	521.20
1991	-16.40	-249.00	-9.00	-100.20	581.20
1992	-16.40	-249.00	-9.00	-100.20	581.20
1993	-16.40	-249.00	-9.00	-100.20	581.20
1994	-16.40	-249.00	-9.00	-100.20	581.20
1995	-16.40	-249.00	-9.00	-100.20	581.20

MEAN PRESENT VALUES IN UNITS OF M$ 1000

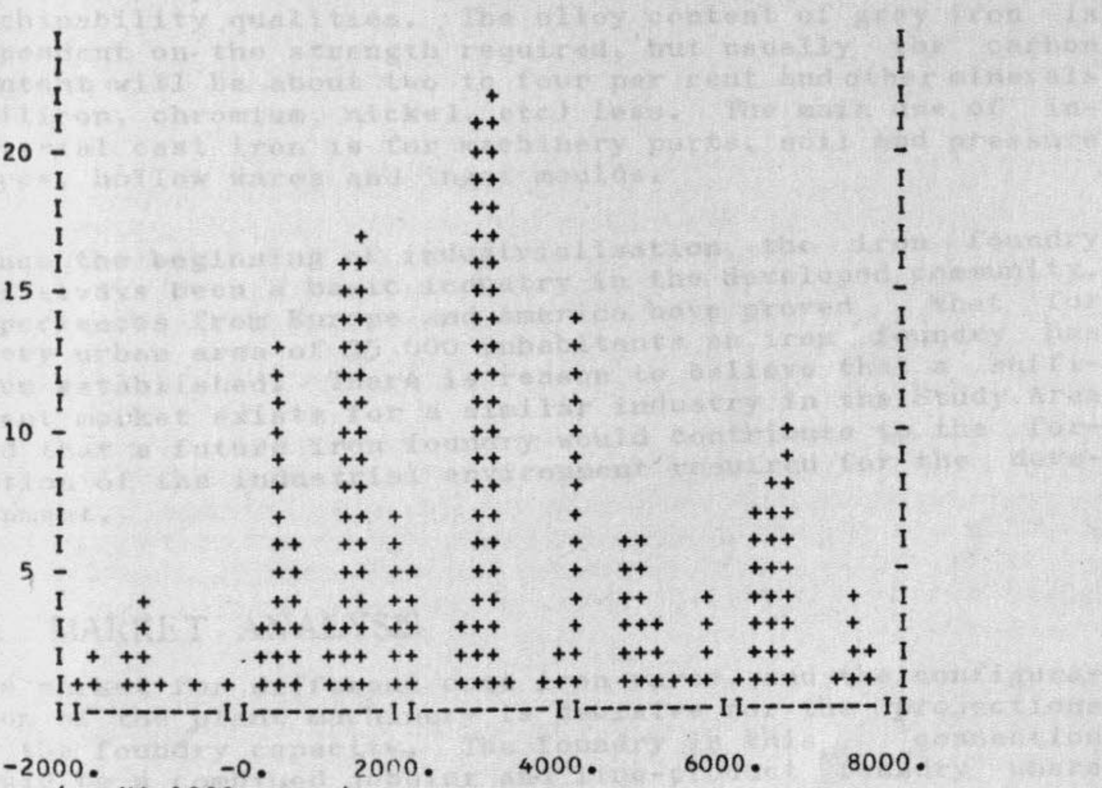
RATE (%)	HOUSE UNITS	PLANT	WORK CAPITAL	MPRG.TIMBER	OTHER MATR.
7	30975.02	-529.51	-686.14	-14099.95	-7706.19
10	24498.79	-502.11	-669.50	-11151.89	-6094.97
14	18671.51	-476.40	-649.45	-8499.25	-4645.21

RATE (%)	FUEL ETC	WAGES	MAINTENANCE	MISC.	NET
7	-156.68	-2579.41	-80.43	-985.30	4151.39
10	-123.87	-2063.76	-63.32	-784.47	3044.88
14	-94.36	-1595.95	-48.04	-603.78	2059.07

INTERNAL RATE OF RETURN > 25.0 %

Figure 3.8 shows the distribution of a random sample (200) of the net present values at 10 per cent for different cost/price combinations. The distribution is mainly of theoretical interest, but illustrates the probability for the price assumption in the cash flow calculation. The mean value and the standard deviation is calculated below figure 3.8.

FIGURE 3.8 RANDOM SAMPLE OF 200 NET PRESENT VALUES FOR A RATE OF 10 PER CENT PER ANNUM



DISTRIBUTION HAS A STANDARD DEVIATION OF 2263.10 M$ 1000

ABOUT A MEAN OF 3034.65 M$ 1000

CHAPTER 4
IRON FOUNDRY

The purpose of this iron foundry is the production of cast iron, mainly for industrial and construction purposes. The character of cast iron is such that its workability when finished is very limited; because it is brittle it is almost certain to shatter if dropped. The advantage of cast iron is its relatively low melting point, its ability to be cast into intricate shapes, and the consequent low production cost.

The iron used for industrial iron casting is usually grey iron, which possesses the necessary melting, pouring and machinability qualities. The alloy content of grey iron is dependent on the strength required, but usually the carbon content will be about two to four per cent and other minerals (silicon, chromium, nickel, etc) less. The main use of industrial cast iron is for machinery parts, soil and pressure pipes, hollow wares and ingot moulds.

Since the beginning of industrialisation, the iron foundry has always been a basic industry in the developed community. Experiences from Europe and America have proved that for every urban area of 35 000 inhabitants an iron foundry has been established. There is reason to believe that a sufficient market exists for a similar industry in the Study Area and that a future iron foundry would contribute to the formation of the industrial environment required for the development.

4.1 MARKET ANALYSIS

The market for different cast iron wares, and the configuration of the plant machinery is decisive for the projections of the foundry capacity. The foundry in this connection would be a combined jobbing and line-product foundry where both custom ordered iron castings and standard items should be manufactured. The range of line products is assumed to cover:-

- cast iron soil pipes,
- floor traps, manhole covers, etc.,
- cooking utensils.

The job product market would cover specific items for a wide range of industries:-

- oil production,
- ship-building,
- public works contractors,
- general construction (including LNG plant).

The line products should be designed in order to offer both quality and price competition to imported products. The idea of introducing a more sophisticated and expensive product, (like AMW in Kuching) cannot be recommended when the primary aim is to establish an industrial development and at the same time if possible, reduce product costs for the local consumers.

The market for cast iron soil pipes can be estimated on the further housing demand in the Study Area. The foundry is expected to cover local demand only. The standard assortment of soil pipes include:-

	Approximate weight (lbs)
six feet pipes	56
sockets	2
T - pieces	11
elbow pieces	8

In low cost housing with good sanitary installations, the demand for soil pipes will probably amount to 250 pounds per unit. In higher income houses, especially in urban areas 500 pounds per unit is estimated. The introduction of extended sewage systems in urban areas will increase these estimates considerably.

If the local foundry is to cover 75 per cent of the potential local market which includes about 900 low cost and 500 other houses per year, and an annual public and mercantile construction of 20 buildings/complexes and 50 units respectively, the total capacity required for soil pipes would be approximately 450 to 500 tons per year.

The market for manhole covers, floor-traps and other sanitary cast iron installation wares is assumed at 50 tons per year in the five year period for 1975 to 1980.

The demand for cast iron cooking utensils would be based on frying pans which vary in size from 14 to 20 inches weighing from four to 9.5 pounds. The average lifetime of the iron pans seems to vary between two and three years, and with 25 000 households as the market base the annual requirement would be 40 to 50 tons.

The demand for special products from a jobbing foundry is difficult to estimate, no capacity has been available before and demand from the biggest industry in the Region (Sarawak Shell Berhad and its contractors) could be covered from Labuan and elsewhere, without registration in Sarawak import statistics.

The demand for jobbing foundry goods could be estimated at an initial volume of 300 tons increasing to double within the first five years of operation. In consequence of this, an annual total foundry capacity of 1 500 tons or 125 tons per month should be planned for.

As trade statistics are insufficient, especially for the Fourth Division, the past supply of cast iron products is difficult to assess. In the years from 1968 to 1972 approximately 3 000 tons annually of cast iron products, in the Standard International Trade Classification(SITC) code groups 673 to 679 and 691 to 697, were officially imported to Sarawak. Of this between 25 and 30 per cent was imported through Miri port which would indicate that Sarawak Shell Berhad affects the demand considerably. Past trends would well justify a local demand projection as estimated above.

4.2 RESOURCE ANALYSIS

The raw materials for cast iron varies for the type of final product required. However, as the production is based on grey iron products (only special orders might require white iron or semi steel/steel alloys) pig iron will be the main raw material. But also, as most of the products do not require specifications in classes over 40 000 pounds/square inch tensile strength, larger amounts of scrap iron might be used when available. For instance, soil iron pipe production often involves the use of 75 per cent scrap and 25 per cent pigiron.

As scrap iron is available in large quantities in Miri from former Sarawak Shell Berhad inland drilling operations (estimated at 4 000 to 5 000 tons) a local resource for the foundry is available for the first years of operation, and as oil exploration and exploitation still dispose of scrap iron a local supply might be available over a longer period.

Pig iron must be imported and it is also necessary to import coke.

Limestone, clay, and sand (silica) for moulds will be available locally. The annual requirements for raw materials would at full capacity be approximately:-

	Tons
Pig iron	*450
Scrap iron	1 350
Coke	*300
Sand (silica)	300
Limestone	30
Other materials	*100

* imported

In connection with the resource analysis the labour factor is most important. Mouldings and the production of moulds requires extremely skilled labour, and as no local workers possess the required skills an initial introduction of foundry workers from Peninsular Malaysia would be necessary.

4.3 TECHNICAL DESCRIPTION

The production process of iron casting consists of the pattern making, the sand preparation, the mould making, the melting and the finishing.

Pattern making is the production of the pattern for the iron casting to be made. For special orders drawings will be submitted and a wooden pattern produced according to the technical specifications. The pattern making requires a special workshop with a skilled wood worker as first pattern maker.

Sand preparation is carried out by mixing silica sand, clay and used unburned moulding sand. Sand preparation is carried out manually or mechanically, but irrespective of the method a high degree of regularity is essential. Bentonite and mineral black is usually added to the sand mix.

The mould is made by using the pattern whose shape is essentially that of the desired casting. A refractory (such as moulding sand) is packed around the pattern. When the pattern is withdrawn, its imprint is left as a cavity in the refractory.

Melting is carried out in a cupola furnace, which is a vertical, cylindrical type of furnace consisting of a steel shell lined with fire bricks. The furnace is charged through a charging door close to the top of the cupola and the batch of materials include iron, coke, limestone and other minerals. A blower unit is need to supply air for the combustion. The cupola for the kind of foundry described here would not need a dimension of more than 35 inches in diameter. Operation is simple and economical as the fuel (coke) and metal are mixed and thus in intimate contact with each other.

When the iron is melted it is drawn off in a refractory ladle which is carried to the pouring bay where the metal is poured into the moulds. When the castings have cooled, they are shaken out, the risers are broken off and returned to the cupola while the sand is screened for reusability.

The castings are finished by cleaning off with a steel brush or by sand-blasting. Grinding is carried out if necessary and further manufacturing on a lathe is done if specified for special orders.

The plant comprises the major components shown in Table 4.1.

TABLE 4.1 MAJOR PLANT COMPONENTS IN AN IRON FOUNDRY (late 1973 prices) (in dollars)

Raw material storage and preparation (scrap breaking equipment, hoists)	80 000
Cupola with hot blast	130 000
Sand slinger, muller, conditioner	90 000
Ladles, refractories	25 000
Moulding machines	120 000
Miscellaneous core ovens, scales and other equipment	40 000
Lathe and other tools	45 000
Transport equipment	30 000
Total plant equipment	560 000

The plant shown in Table 4.1 covers a range of machinery mainly of foreign origin, but some items such as for example the cupola might be constructed locally under expert supervision.

The intake of raw materials and the market for the finished products would have a big influence on the location of the plant. Also fuel will play an important part. The example in Table 4.1 makes use of a hot blast cupola with coke as fuel, however, if cheap gas is available, fuel costs would be reduced considerably by the use of an air furnace melting technique. This would also allow for the use of bigger pieces of scrap and the processing of higher strength irons because of the better temperature control.

For the above reasons Miri would be the best location. The biggest market would probably be in the Miri region, all the scrap iron is located in the same area, and gas is easily available from Lutong.

The total capital requirement will include investment costs and working capital. The total investment in fixed assets will be as shown in Table 4.2.

4.4 OPERATION

The iron foundry is designed for local management and operation. But as this industry is still new to Sarawak an initial employment of outside technicians will be necessary. The

TABLE 4.2 TOTAL INVESTMENT IN FIXED ASSETS
(in dollars)

Land (no cost calculated)	-
Building - office 2 000 square feet	30 000
plant 15 000 square feet	150 000
Equipment	560 000
Vehicles	30 000
Office, miscellaneous	10 000
Total fixed assets	780 000

Working capital will be specified in a later section.

plant should thus start its operation with migrant skilled moulders and a technical manager with an engineering background.

The actual running-in period will take three to four months and only after this will a commercial operation be possible. The phasing of the utilisation of the foundry is assumed at:-

Year	Capacity (per cent)
1	70
2	74
3	78
4	82
5	87
6	91
7	97

- and full capacity thereafter.

The labour input will be constant irrespective of the production. The staffing requirements for one shift operation are shown in Table 4.3.

Other production costs include raw materials, power and maintenance. The input of raw materials will depend on the composition of the production, however, the production pattern is assumed to require the following input at full capacity:-

			Dollars
pig iron	450 tons	at $285 per ton	128 300
scrap iron	1 350 tons	at $110 per ton	148 500
coke	300 tons	at $450 per ton	135 000
limestone etc.	30 tons	at $ 20 per ton	600
moulding sand	300 tons	at $ 10 per ton	3 000
other minerals	100 tons	at $250 per ton	25 000
Total raw material costs			440 400
Power (175 kWh by 1 500) at		$0.09	23 600

Maintenance of equipment is calculated at eight per cent of equipment costs, in total $45 000. Insurance is estimated at 2.5 per cent of plant investment, in total $19 000.

TABLE 4.3 STAFFING REQUIREMENTS FOR AN IRON FOUNDRY (in dollars)

Direct Labour		
Technical manager	1 at $24 000	24 000
Technicians	2 at $14 000	28 000
Skilled labourers	10 at $ 6 000	60 000
Semi-skilled	15 at $ 4 000	60 000
Unskilled	20 at $ 3 000	60 000
Maintenance and inspection	2 at $ 4 000	8 000
Sub total direct labour	50	240 000
Management		
Technical manager (cf. above)	-	-
Office manager	1 at $15 000	15 000
Accountant	1 at $10 000	10 000
Clerks, typist	3 at $ 3 000	9 000
Sub total Management	5	34 000
Total employment	55	274 000

4.5 ECONOMIC EVALUATION

The feasibility of the iron foundry depends on price and cost developments, but the composition of the future product lines will also be of economic importance.

The following average prices have been assumed for the finished products ex-foundry:

	Dollars/pound
soil pipes, floor traps	0.70
cooking utensils	0.80
standard orders;	
- general	1.00
- special	2.00

For the economic evaluation price relations are assumed to be constant.

The economic feasibility of the project has been worked out with cash flow calculations for the technical life of the plant. Also internal rate of return and net present values for varying interest rates have been calculated.

TABLE 4.4 MEAN COSTS AND BENEFITS (THOUSAND DOLLARS)

IRON FOUNDRY PLANT
CONSTRUCTION YEAR: 1976
FIRST YEAR OF OPERATION: 1977
MAXIMUM CAPACITY CIRCA 1 500 TONS PER ANNUM
FULL CAPACITY: 1983

YEAR	SOILPIPE ETC	COOK.UTENSIL	SPEC.ORDERS	PLANT	WORK.CAPITAL	PIG IRON
1976	0.0	0.0	0.0	-780.00	-353.30	0.0
1977	760.90	62.60	1444.60	0.0	-287.50	-94.70
1978	802.75	66.04	1524.05	0.0	-112.70	-99.91
1979	846.90	69.68	1607.87	0.0	-81.30	-105.12
1980	893.48	73.51	1696.30	0.0	-35.60	-110.33
1981	942.62	77.55	1789.60	-30.00	0.0	-115.53
1982	994.46	81.82	1888.03	0.0	0.0	-120.74
1983	1049.16	86.32	1991.87	0.0	0.0	-125.95
1984	1096.52	89.40	2067.40	0.0	0.0	-131.16
1985	1125.52	89.40	2067.40	0.0	0.0	-134.30
1986	1156.12	89.40	2067.40	-188.00	0.0	-134.30
1987	1188.40	89.40	2067.40	0.0	0.0	-134.30
1988	1222.45	89.40	2067.40	0.0	0.0	-134.30
1989	1258.38	89.40	2067.40	0.0	0.0	-134.30
1990	1296.29	89.40	2067.40	0.0	0.0	-134.30
1991	1336.27	89.40	2067.40	-30.00	0.0	-134.30
1992	1378.46	89.40	2067.40	0.0	0.0	-134.30
1993	1422.97	89.40	2067.40	0.0	0.0	-134.30
1994	1469.93	89.40	2067.40	0.0	0.0	-134.30
1995	1519.47	89.40	2067.40	0.0	0.0	-134.30
1996	1571.73	89.40	2067.40	0.0	0.0	-134.30

YEAR	SCRAP IRON	OTHER MATR.	FUEL ETC	WAGES	MAINTENANCE	MISC.	TOTAL
1976	0.0	0.0	-26.40	0.0	0.0	-26.20	-1185.90
1977	-109.40	-21.20	-118.80	-230.50	-31.00	-55.40	1319.60
1978	-115.42	-22.37	-125.33	-246.63	-32.24	-58.45	1579.79
1979	-121.76	-23.60	-132.23	-263.90	-33.53	-61.66	1701.35
1980	-128.46	-24.89	-139.50	-282.37	-34.87	-65.05	1842.21
1981	-135.53	-26.26	-147.17	-286.30	-36.27	-68.63	1964.08
1982	-142.98	-27.71	-155.27	-286.30	-37.72	-72.41	2121.19
1983	-150.84	-29.23	-163.81	-286.30	-39.22	-76.39	2255.59
1984	-156.30	-30.60	-169.00	-286.30	-40.79	-79.30	2359.86
1985	-156.30	-30.60	-169.00	-286.30	-42.43	-79.30	2384.09
1986	-156.30	-30.60	-169.00	-286.30	-44.12	-79.30	2224.99
1987	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2444.40
1988	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2478.45
1989	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2514.38
1990	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2552.29
1991	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2562.27
1992	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2634.46
1993	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2678.97
1994	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2725.93
1995	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2775.47
1996	-156.30	-30.60	-169.00	-286.30	-45.00	-79.30	2827.73

MEAN PRESENT VALUES IN UNITS OF N$ 1000

RATE (%)	SOILPIPE ETC	COOK.UTENSIL	SPEC.ORDERS	PLANT	WORK.CAPITAL	PIG IRON
7	11406.71	858.01	19822.69	-907.83	-813.95	-1284.18
10	8881.13	678.55	15674.57	-878.29	-793.20	-1015.60
14	6650.55	517.06	11942.23	-850.50	-768.17	-774.04

RATE (%)	SCRAP IRON	OTHER MATR.	FUEL ETC	WAGES	MAINTENANCE	MISC.	NET
7	-1499.80	-292.26	-1651.27	-2925.00	-416.44	-786.48	21510.17
10	-1186.07	-230.98	-1311.73	-2334.42	-328.41	-627.37	16528.15
14	-903.77	-175.86	-1006.12	-1799.30	-249.54	-484.22	12098.32

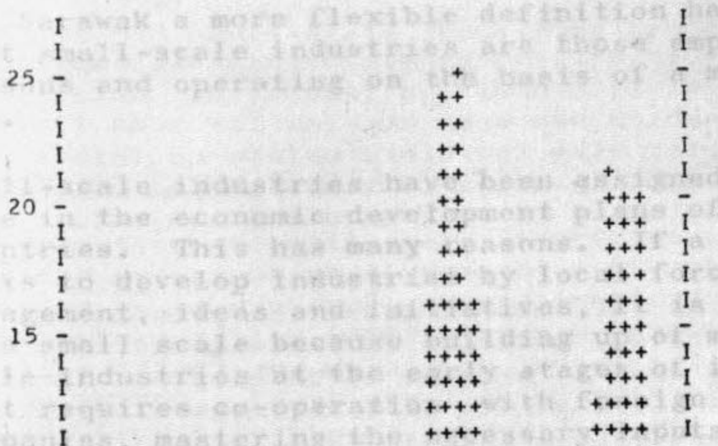
INTERNAL RATE OF RETURN > 25.0 %

The cash flow and economic evaluations are based on the volumes, cost and prices worked out above, but to introduce the possibility of changing price relations to the calculations, probabilities for price increases and decreases have been included. In consequence the economic evalu tions are based on statistical mean-values and not directly on the cost and prices quoted in the project description. The evaluation has been computed on an IBM 370/145.

Table 4.4 indicates the cash flow from the plant in thousand dollars based on the highest probability of the different price assumptions. The net present values of the single items in the cost/income calculation have been calculated at the interest rates 7, 10 and 14 per cent. The internal rate of return (IRR) is indicated at the foot of Table 4.4, and where the IRR is above 25 per cent is is not specified further.

Figure 4.1 shows the distribution of a random sample (200) of the net present values at 10 per cent for different cost/price combinations. The distribution is mainly of theoretical interest, but illustrates the probability for the price assumption in the cash flow calculation. The mean value and the standard deviation is calculated below figure 4.1.

FIGURE 4.1 RANDOM SAMPLE OF 200 NET PRESENT VALUES FOR A RATE OF 10 PER CENT PER ANNUM



DISTRIBUTION HAS A STANDARD DEVIATION OF 1440.14 M$ 1000

ABOUT A MEAN OF 16622.82 M$ 1000

CHAPTER 5
SMALL-SCALE INDUSTRIES

5.1 INTRODUCTION

Small-scale industry is a concept known and used all over the world. Although small-scale industry in general is associated with industries having few employed and operating on a low capital basis, the concept is far from unambiguous. It varies from country to country according to the purpose in view and the level of industrial development. Some African countries define cottage and small-scale industries as, industries which are operated by a labour force not exceeding 500 workers and not using any motive power in any operation. In Indonesia (1955) small-scale industries were defined as those which employed less than 10 full-time workers and did not use mechanically driven tools or machinery, and Japan (1973) defines small-scale industries as, industries employing less than 200 persons and having a basic capital input of less than $1 mn.

A definition is necessary for statistical reasons and also because Government, if special aids and subsidies are given to small-scale industries, would need to limit the group of potential receivers. However, the definition must not be a straitjacket for the administration of possible aids and subsidies. From time to time it should be reviewed and changed according to the shifting conditions of industrial development.

For Sarawak a more flexible definition has been chosen saying that small-scale industries are those employing less than 10 persons and operating on the basis of a moderate capital input.

Small-scale industries have been assigned a very important role in the economic development plans of most developing countries. This has many reasons. If a developing country wants to develop industries by local forces, such as capital, management, ideas and initiatives, it is necessary to start on a small scale because building up of medium and large scale industries at the early stages of industrial development requires co-operation with foreign or international companies, mastering the necessary inputs of technical know-how, managerial experience and risking capital investment The small-scale industries serve as a nursery for entrepreneurial talent and in the longer run it is hoped that some of the industries started on a small scale will grow into locally owned and managed medium and large-scale industries.

Moreover, small-scale industries do not need an industrial environment to operate, but can be integrated in smaller urban and rural societies. In this way establishment of small-scale industries outside the major industrial development areas is a tool for the Government in its attempt to:

- spread the industrial development,
- create jobs,
- diversify the job opportunities outside the major urban centres,
- reduce migration to urban areas.

It is also the hope that local production will result in cheaper goods and commodities. Where the produced goods are import substitutes it results in savings of foreign exchange.

Despite the economies of scale, that generally favour large-scale industry, certain types of small-scale industries have proved highly viable even in the most industrialised countries. Thus small manufacturing units have an advantage where non-transportability of the product or relatively high transport costs set a narrow limit to the size of the market that can be efficiently supplied from one producer. Where the demands of the buyers are highly specialised or individualised, the size of the market for any particular item tends to be limited and small manufacturing establishments may be able to meet these demands more efficiently than larger establishments. And finally there are certain productions with no economies of scale - these even may be dis-economies - where small-scale production would have an advantage.

Small-scale industry is a frequently and carefully described subject in the special literature on industrial development and it is a subject which has been studied for some time in Malaysia. This chapter will therefore mainly contain a summary of ideas and arguments known to those people who have already had the opportunity to look into the subject.

Paragraph 5.2 contains information about the present number and types of small-scale industries in Sarawak and 5.3 expounds what is being done at present to develop and promote small-scale industries. A sketch of a development programme for small-scale industry is presented in paragraph 5.4 and in paragraph 5.5 an outline is given of how to implement the programme. Finally 5.6 gives examples of industries which are not to be found in Sarawak at present but the establishment of which should be taken up for a closer examination.

5.2 SMALL-SCALE INDUSTRIES IN SARAWAK AT PRESENT

A considerable number of small-scale industries are working in Sarawak at present. Table 5.1 shows the number of units in 1969 and the number of persons (converted to full-time workers) employed by these units distributed by Divisions.

TABLE 5.1 SMALL-SCALE INDUSTRIES BY DIVISIONS 1969

Division	Units	Per cent
First	870	50
Second	130	8
Third	530	30
Fourth	170	10
Fifth	30	2
Total	1 730	100

Out of a total number of 1940 industrial units in Sarawak in 1969, small-scale units constituted 90 per cent. However, at the same time only 25 per cent of the industrial labour force was employed in small-scale units.

Table 5.2 shows the distribution of small-scale industries by type of production.

50 per cent of all small-scale industry units are found within food manufacturing, beverage manufacturing, and manufacture of wood and rattan products (except furniture and footwear). Manufacture of furniture and rubber products constitutes a surprisingly low share of the total, together only two per cent.

In Table 5.3 small-scale industries are distributed by type of production and Divisions.

5.3 PROMOTION OF SMALL-SCALE INDUSTRIES IN SARAWAK

The promotion of small-scale industries is not assigned to one specific organisation at present. Credit for small-scale industries is to a certain extend provided by the Borneo Development Corporation (BDC), Sarawak Economic Development Corporation (SEDC) and Malaysian Industrial Development Corporation (MIDC). Loans are also granted by commercial banks, and the Credit Guarantee Corporation was established in 1972 to provide guarantee cover for bank loans to small-scale enterprises.

The Education Department operates two Vocational Institutes where people are educated in industrial and clerical work, but they are not aiming especially at creating small-scale industrialists. The National Productivity centre holds management courses for supervisory and executory staff within the public and private sectors.

TABLE 5.2 SMALL-SCALE INDUSTRIES BY TYPE OF PRODUCTION 1969

Type	Number of establishments	Per cent
Processing of estate type agricultural products in factories off estates	71	4
Food manufacturing industries	350	20
Beverage manufacturing industries	228	13
Manufacture of footwear (except rubber footwear) other wearing apparel and made-up textile goods	89	5
Manufacture of wood and rattan products except furniture and footwear	296	17
Manufacture of furniture and fixtures	15	1
Printing, publishing and allied industries	27	1
Manufacture of rubber products	20	1
Manufacture of non-metallic mineral products except petroleum and coal products	131	8
Manufacture of metal products except electrical machinery and transport equipment	45	3
Manufacture of machinery except electrical machinery	66	4
Manufacture of transport equipment	169	10
Other manufacturing industries	223	13
Total	1 730	100

Finally it should be mentioned that a Federal committee is working on the small-scale industry subject. The Consultants have approached the committee for information about its work and ideas but had no response before the end of the Study. It is recommended that pertinent Sarawak authorities keep in contact with the committee.

5.4 OUTLINE OF A DEVELOPMENT PROGRAMME FOR SMALL-SCALE INDUSTRY

One of the basic programmes of assistance necessary for small-scale industries development is a programme providing industrial extension services to transmit knowledge and skills to persons engaged in industrial activities. Such

TABLE 5.3 SMALL-SCALE INDUSTRIES BY TYPE PRODUCTION AND BY DIVISION

Type	1st Division		2nd Division		3rd Division		4th Division		5th Division		Totals	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Processing of estate-type agricultural products in factories off estates	35	50	20	28	11	15	5	7	-	-	71	100
Food manufacturing industries	131	37	45	13	139	40	35	10	-	-	350	100
Beverage manufacturing industries	110	48	17	8	84	36	6	3	11	5	228	100
Manufacture of footwear (except rubber footwear) Other wearing apparel and made-up textile goods	64	72	-	-	13	15	12	13	-	-	89	100
Manufacture of wood and rattan products except furniture and footwear	152	51	25	8	79	27	38	13	2	1	296	100
Manufacture of furniture and fixtures	6	40	1	7	5	33	2	13	1	7	15	100
Printing, publishing and allied industries	6	22	-	-	9	33	12	45	-	-	27	100
Manufacture of rubber products	13	65	-	-	1	5	6	30	-	-	20	100
Manufacture of non-metallic mineral products except petroleum and coal products	106	81	-	-	19	14	6	5	-	-	131	100
Manufacture of metal products except electrical machinery and transport equipment	30	67	5	11	8	18	2	4	-	-	45	100
Manufacture of machinery except electrical machinery	32	48	5	8	22	33	1	2	6	9	66	100
Manufacture of transport equipment	87	41	-	-	60	36	22	13	-	-	169	100
Other manufacturing industries	98	44	11	5	80	36	23	10	11	5	223	100
Total	870	50	129	8	530	30	170	10	31	2	1 730	100

assistance is required in the main factors of economy, management, and product improvement.

Economic assistance starts with the counselling required for pre-investment appraisal: for example, assessing the prospects of particular industries, selecting a location, and estimating capital requirement and potential markets. After an enterprise has started, small entrepreneurs will continue to require assistance with credit, advice on raw materials, labour, factory space, marketing, etc. Existing firms are also in need of such counselling to diversify their production and improve their efficiency. Industrial extension work may take the form of individual counselling by a visit to the enterprise, a service providing information through pamphlets and publications, and regular courses of training.

Providing credit on liberal terms is not in itself an adequate form of assistance to small enterprises in developing countries. The small entrepreneur is in need of guidance and counselling on the proper use of credit. He needs to know how large an inventory to keep and on what terms and in what manner to sell his products. It is in such circumstances that supervised credit becomes important. Under such a scheme credit would be integrated with technical and management assistance so that the small entrepreneur would be able to obtain the maximum advantages from the loan he would receive. A very successful form of supervised credit is the supply of machinery on a hire-purchase basis. The small-scale industry promotion agency arranges to supply equipment on hire-purchase terms and assist the entrepreneur to improve the production processes so as to achieve more economical operation and consequently higher earnings. He would often be able to pay the instalments on the equipment out of the additional earnings arising from its use. This form of supervised credit ensures that the capital made available for a small entrepreneur is also used for the purpose intended.

Industrial estates have proved to be an efficient method of encouraging the establishment, expansion and modernisation of small-scale industry. An industrial estate is a planned group of industrial enterprises offering factory buildings and a variety of services and facilities to the occupants. Grouping facilitates some of the economies of scale, and contributes to efficiency of specialisation which is usually obtained only in large-scale industry. Efficient division of labour is possible in an estate through inter-trading and inter-servicing among the occupants. The grouping of industrial units in one place could also facilitate co-operation in the purchase of raw materials, the sale of finished products, the organisation of transport facilities, etc.

The availability of an industrial extension service on an estate would be another important inducement to the small entrepreneur, providing him with day-to-day guidance. Further, the organisation of an extension service could be arranged more efficiently and economically in an industrial estate.

Industrial estates could be sponsored by the Government or by Statutory Bodies, that is, co-operatives, associations of industrialists, or chambers of commerce. Adequate inducement should be offered to the occupants to take over responsibility for the estate in due course. Factories or workshops could be offered on hire-purchase terms or for outright sale to tenants, and those who rent the premises should be encouraged to take them over on a hire-purchase basis when they can afford it.

The need for thorough surveys and feasibility studies to assess the economic, engineering and physical factors involved in siting and planning an estate cannot be over emphasised. Experience has shown that some industrial estates, which were started without proper feasibility studies, have turned out to be failures.

The limitations of the industrial estate however, should not be overlooked. It will not by itself be able to provide all the essential facilities and environment required for industrial development. Industrial estates can accommodate only a small proportion of all small enterprises in a country. The majority of small enterprises will remain outside, but will still require promotional services and support.

5.5 IMPLEMENTATION OF THE PROPOSED SMALL-SCALE INDUSTRY PROGRAMME

It is recommended that a department should be established within SEDC with the objective to develop and promote small-scale industry in Sarawak. A working group, possibly assisted by United Nation Industrial Development Organisation or other experts, should be set up having the task to formulate a small-scale industry development policy for Sarawak according to the ideas outlined in this chapter. Having formulated the policy and obtained Government approval the working group should commence implementing the policy within a limited area. The implementation should comprise both an industrial estate and small-scale enterprises outside the estate. Four types of studies would be required, namely

- area surveys;
- market surveys;
- industry feasibility studies, and
- model schemes or industry guide sheets.

Each of these are further described below.

An area survey is a study of the industrial potential of a given area. The survey is an orderly, systematic investigation and analysis of the resources and markets of the area. It examines the competitive advantages or disadvantages of the area for each potential industry as related to alternative sources of supply. The preparation of an area survey involves four general types of inter-connected analyses: firstly, an analysis of existing and potential demand within and outside the area for manufactured goods that might be met and which could be produced economically by industrial enterprises located in the area; secondly, an assessment of resources, human as well as material, which are available in the area, or could be imported from outside at reasonable cost, and which are required for setting up manufacturing enterprises in specific industrial sectors; thirdly, an appraisal of the existing and prospective infrastructure (development) of the area, that is, its economic overhead facilities and social services, and the extent to which it could support industrial development; and finally, recommendations on those industries which are feasible and desirable, considering the demand, the resources and the infrastructure development of the area. The area survey is carried out against the background of development plans of the country or of the area, and takes into account the implications for industrial development of projects in the field of agriculture, natural resources, power, irrigation, transport and so on. A carefully prepared area survey should provide the basis for a phased programme of industrial development, pin-pointing short-run and long-run industrial possibilities and the necessary measures of promotion and assistance.

Market surveys provide information on the outlets for given products which could be of interest to existing and potential entrepreneurs. Such information is needed not only to improve distribution and to expand sales but also to assess the feasibility of candidate industries. The surveys cover size and location of markets and distribution centres, marketing channels, pricing policies and practices of wholesale and retail dealers and middlemen, distribution costs, characteristics of competing products, standardisation and quality specifications, branding, packaging, publicity and advertising and consumer acceptance of existing or new products. Market surveys also provide information on the potential size of the market, the long-run effect of substitute products and the elasticity of demand.

An industry feasibility study is concerned with the economic prospects of establishing and expanding a particular industry or manufacturing a specific group of products. The study attempts to evaluate and measure all the relevant factors - import, export, domestic demand, competition, raw material availability, capital, labour skills, production processes, etc. It provides conclusions and recommendations on the number and size of enterprises to be encouraged and their location, production, financing and marketing, investment required, cost of production and profitability, and policies and measures for establishment or expansion of the industry. Where an industry is considered to be not feasible, either in the short run or in the long term, the study would examine the reasons for such a conclusion and recommend either that the industry be discouraged or that measures be taken to improve the long term prospects.

When an area survey or an industry feasibility study reveals favourable prospects for an industry or a given product, it is useful to prepare a model scheme or industry guide sheet for the use of entrepreneurs wishing to enter the industry or expand their product lines. These are short information pamphlets summarising the essential requirements for establishing and operating the industry, or manufacturing the product. The information furnished describes the products to be manufactured, the process of manufacture, the size of operation, the requirements of fixed capital for land, buildings, machinery and equipment, the requirements of working capital for materials, stores, wages and other charges; and an estimate of the income and expenditure of the enterprise, and of its anticipated profitability.

Having carried through the necessary studies the group extension service team starts an information drive in the area, addressing themselves to the population through radio, television, newspapers, pamphlets and lectures. People interested in participating in the small-scale industry scheme would attend the training course arranged by the extension service team. The course should be held in the evening so that the people can continue their present occupation in the day time. The content of the course should be such that the persons get a basic knowledge of technical problems, administration, management and business matters. After the course the practical work commences. Guided by the extension service team the individual entrepreneur establishes and organises his own enterprise and starts operating.

5.6 IDENTIFICATION OF POSSIBLE SMALL-SCALE INDUSTRIES

This paragraph does not intend to work out model schemes or industry guide sheets, but only to outline some productions which it is considered would be suitable for adoption in the Study Area.

Production of wooden soles

- the world market for wooden soles and clogs is extensive,
- among the numerous types of wood in Sarawak it should be possible to find a suitable hard and light one for this purpose,
- the production process is simple,
- the capital requirement is low.

Production of marmelades

- the market for marmelade is still expanding in Sarawak,
- almost all marmelades sold in Sarawak at present are imported mostly from foreign countries,
- the prices of imported marmelades are rather high and local production would offer a competitive alternative,
- Sarawak has a large selection of raw materials for this kind of production,
- the production process is simple,
- the capital requirement is low.

Other possibilities

(a) Resources Processing

(i) Dessicated coconut flesh, and coconut oil
(ii) Smoked and scraped rubber
(iii) Tapioca flour and chips
(iv) Brown sugar; and juices for drinks
(v) Ground coffee
(vi) Soya bean curd, water and flour
(vii) Roasted ground-nuts
(viii) Fish balls, fish sausage, salted fish and preserved fish

(b) Wood-based

(i) Crates for bottles etc.
(ii) Packing cases
(iii) Wooden containers and drums (kegs)
(iv) Prepared joinery for houses - doors, windows etc.
(v) Educational instruments
(vi) Wooden toys, and wooden carvings
(vii) Radio, radiogram and television cabinets

(c) Light Industry

(i) Paper clips, hair pins, snap-buttons
(ii) Light agricultural implements
(iii) Water tanks, bins, letter boxes
(iv) Bolts, nuts, rivets, washers and screws
(v) Gloves
(vi) Men's working-shirts and underwear
(vii) Umbrella assembly units
(viii) Candles
(ix) Charcoal from wood-waste, padi husks
(x) Paper bags from waste newspaper

(xi) Cement blocks, bricks clay earthenware

(xii) Leather shoes, bags, belts

(xiii) Rattan/bamboo furniture, mats, domestic utensils

(xiv) Metal furniture, and other articles such as poultry cages and shelves

(xv) Soap

(d) <u>Food</u>

(i) Bakery, confectionery

(ii) Noodles

(iii) Ice-cream

(iv) Pickles, jam, fruits e.g. oranges, pineapples

(v) Sauces - chilli, soya bean, fish, prawns

(vi) Fruit cordial, tuak

CHAPTER 6

PRIVATE SERVICES

6.1 GENERAL

Private services comprise a wide range of activities which serve private households, the private production sector and the public sector. The individual service establishment can range from a high-capital powered bank to a one-person stall or pedling hawker. The sector can be classified as follows:-

Retail Trade: including trade in:-

- consumer goods sold from shophouses or stalls for immediate consumption, including such items as food, fruit, clothing, books and jewellery; and for consumer durables such as refrigerators and furniture;
- capital goods sold from shophouses, stores and workshops for production, such as tools, machinery, transport equipment, outboard motors and hardware.

Wholesale Trade; being the sale of both consumer and capital goods to retail dealers or to large consumers such as schools, barracks and factories.

Specialised Services; comprising professions such as medical doctors, lawyers, accountants, engineers and architects.

Higher Business Services; such as banks, insurance companies and brokers, some of these services being performed through a network of branch organisations.

Other Services; including hotels, restaurants and coffee-houses, cinemas, photographers and travel agencies.

By far the larger part of these activities is located in towns; a few, such as retail shops, are found in villages. The number and type of private service establishments vary according to the size and income of the population in the hinterland of the towns and villages concerned. In Supporting Report 6 the expected norms and standards for establishing new services in new and expanding towns of the Study Area are given.

6.2 PRESENT AND FUTURE IMPORTANCE OF SERVICES

There has not been a sufficient statistical basis for working out specific target figures for the private services sector alone, but only for service sectors as a whole. For the whole group Table 6.1 expresses the target development.

For the whole period 1970 to 1990 employment is envisaged as growing at the same rate as the population; a little less in the first decade, a little more in the second. The reason for

TABLE 6.1 EMPLOYMENT AND PRODUCTION VALUE IN SERVICES

	1970	Growth rate 1970/80 (per cent)	1980	Growth rate 1980/90 (per cent)	1990	Growth rate 1970/90 (per cent)
Number of employed	9 500	3	13 000	6	23 000	4.5
Percentage of total employment	24%	-	21%	-	23%	-
Production value employment $	5 300	2.5	6 800	2.5	8 700	2.5
Production value mn$	50	6	90	8.5	200	7
Percentage of total GRP	34%	-	30%	-	32%	-

this moderate growth is that these sectors are likely to contain at present some over staffing or underemployment - which could be somewhat reduced in the first period, while in the second period the increased activity in agriculture and industries will attract the service activity upwards.

The increase in production value is also rather modest, reflecting an expectation that some of the people occupied in these groups belong to the best paid who, in the intended process of redistribution of income, will face a relative reduction of their personal incomes.

6.3 PRESENT AND FUTURE STRUCTURE OF TRADE AND COMMERCE

The trade pattern of the Study Area reflects the basic features of the production pattern, which are:-

- subsistence production of food and other domestic necessities;
- production of moderately processed products for export, such as logs, ribbed smoked sheets of rubber, ungraded pepper and oil;
- a modest production of industrial consumer and capital goods.

For these reasons a significant part of the trade is heavily oriented towards external markets, and is based largely on the collection and export of a limited number of primary products, as well as the import and local distribution of foodstuffs, consumer goods and capital goods. Fourth Division, in common with the rest of Sarawak, trades more with the outside world than it does with neighbouring Divisions in the State.

Commerce is therefore heavily dependent on export/import trade and is consequently particularly sensitive to fluctuations in the price of commodities on world markets. In addition, most external trade, excluding timber and the re-export of petroleum, is channelled through commercial centres outside the Study Area, mainly Sibu, Kuching, Singapore and Peninsular Malaysia. There is little direct consignment of goods to consumer countries or direct import from producer countries. This results in higher costs in transhipment and intermediate trade connections. The trading position of Miri, in particular, is poorly developed. In contrast with other Sarawak towns, Miri lacks an established position as a focal supply point in a major river-based trade network and, despite expanded road links, continues to serve only a restricted hinterland relative to its size.

Four major factors are likely to alter the trade pattern of the Study Area in the future:-

(a) an expansion of internal trade resulting from the growth of local manufacturing industries and increased agricultural production for domestic consumption in urban and estate areas;

(b) increased Government involvement in agricultural marketing, credit and supply;

(c) improved port facilities, possibly including a deep water port at Tanjong Kidurong, reducing the present dependence on external ports and commercial centres;

(d) extension of the road network linking Miri with other major towns and with an enlarged road-supplied regional market.

6.3.1 Trade Networks

Existing trade relations are structured hierarchally by ties that extend from major importation firms through retail and smaller wholesale dealers to a network of rural bazaars, isolated shops and itinerant hawkers. Credit and consumer goods are annelled downwards through these relations while primary p.oducts are channelled upwards for eventual export. Horizontal relations, between firms engaged in trade in the same level, are characterised by competition between generally small, family-owned businesses that serve a limited clientel and provide more or less identical services. Most probably this system is well suited to present circumstances but, it is likely to change under the process of modernisation recommended in the Plan. Restructing this network is, however, likely to prove difficult in areas already settled because individual relations are not exclusively economic in nature. Nevertheless it is both desirable and expected that rationalisation of the network should be undertaken through a reduction of multiple links in the trade chain and through the emergence of larger, more differentiated firms and specialised shops. The last evolution is already manifest in the larger towns in the Area.

Current employment in trade is somewhat less than 2 000 persons, or under five per cent of the total number of employed in the Study Area. Over a third of this number consists of working proprietors, which is indicative of the small size of existing establishments. It is assumed that, in the future, the total number of persons engaged in trade will increase more slowly than the volume of trading activity; individual firms will handle a greater turnover and the proportion of employees to proprietors will increase as the firms grow larger.

6.3.2 Retail Trade

At present the operation of most retail firms combines retailing with credit supply, storage, grading, transport, and marketing, (including knowledge of commercial contracts and market conditions) and as a result, the shopkeeper plays an indispensable role. Most existing retail enterprises are family concerns. The great majority are Chinese owned, although in recent years a growing number of Malay, Iban and other native people have opened shops, some as privately owned ventures, others run as cooperatives. Most operate with little capital and are typically village shops.

Wholesale trade is dominated by major importation firms that deal largely in branded consumer goods for which they act, often through a network of branch offices located in the larger urban centres, as exclusive local distributors. These firms are often externally owned or based outside Sarawak and conduct business either through local agents or secondary wholesalers, a number of whom operate launches or lorries and thus absorb a transport function in their operations. Where they monopolise transport, this combination can severely limit competition. A large part of the current export commodity trade in the Study Area is handled by boat-owners, who buy directly from bazaar traders or act as transport agents.

6.4 COMMERCIAL CREDIT

At present, the more developed credit service system is concentrated in the town where it mainly covers short-term credit requirements. The banks operate as savings institutions, and only a part of the funds acquired from the Region is canalised back into the local economy. A modern banking service primarily aims at a more developed money economy, for which reason its operations are both functionally and geographically concentrated around the more advanced trades and industries in the major towns. This is emphasised by the fact that the agricultural sector only accounts for one per cent of total loans and advances from private financial institutions.

Mortgage institutions have as yet only limited importance as sources of credit. The basis for these institutions is the traditional real estate security, but their loans are usually on relatively short-term conditions running only for 10 to 15 years.

Beside the banks and mortgage institutions a few companies operate as financing agencies. They usually offer a fractional higher interest on long-term deposits, but in general their working field is largely covered by medium-term, ordinary banking business. Their main activity seems to be concentrated on loans for, and with security in, transport equipment and machinery. These financial institutions are often corporately connected to established banking firms.

In addition to institutionalised credit there is trade-based credit, which for rural families implies that the shopkeeper is often a source of productive capital, supplying financial backing for opening new holdings or developing new crops. Usually the credit is in the form of goods or farm requisities, and repayment is made later by the sale of agricultural products. Because of competition between shops and the danger of non-payment, the credit, is as a rule, supplied on favourable terms and there is rarely a direct charge for the service, although indirect charges may be made in the form of price adjustments or lower grading of local products. Repayment schedules are generally flexible and most shopkeepers are interested in keeping a sum outstanding in order to maintain trading relations with their customers. Credit is supplied on the basis of trust and personal knowledge; a farmer's credit-worthiness is gauged more on his repayment record than on his farming ability. The system restricts the number of credit customers a shopkeeper can, or will, carry. Consequently, there is a need for further development of financial institutions, particularly as suppliers of agricultural credit. Besides the shopkeeper, existing cooperative societies and the Cooperative Central Bank Limited engage in rural lending activity, but on a limited scale. More important as a source of productive capital are Government subsidy schemes, but these do not provide credit as such, and narrowly restrict the use to which capital can be put.

In Supporting Report 2 Part III recommendations are given that credit for specific agricultural enterprises in the intensive development areas be provided through the Agricultural Development Unit, which would also provide all supporting services. In this way, the use of credit would be supervised and repayment could be linked to marketing arrangements for the major enterprises. In addition to this it may still be advisable to retain a traditional trade/credit system to finance personal loans for family events. This credit could be based on marketing through this traditional system the produce of minor agriculture enterprises such as pepper, poultry, pigs and vegetables.

In addition there will be need for credit to those who take up farming on a larger scale within areas planned for private independent farmers. The Consultants consider the present credit organisations are adequate and sufficient to carry out this task, but believe that they should participate more fully in the economic opportunities offered by this type of enterprise.

The Land Rent mentioned in the Supporting Report 9: Economy and Finance should render superfluous any credit for taking over small-holdings, and the Sarawak Savings and Development Fund, also mentioned in the same report, could cover the need for financing the purchase or building of houses and other structures.

6.5 PROMOTION OF PRIVATE SERVICES

As in the case of industries, it is also recommended that special initiatives should be taken to promote the development of adequate and up-to-date private services. This, it is believed, could best be done by one central organisations, namely SEDC. The promotional efforts would most probably be concentrated on retail and wholesale trades, such as the Perina chain of retail shops and it could take the form of arranging education, training, consultancy services and credit, either through existing institutions or, if needed, as special arrangements sponsored by SEDC.

Of particular importance to the development of these trades would be the planning of new and expanded towns and of villages. It would be desirable for SEDC to keep in contact with the town planning sections of the Land and Survey Department in connection with the development of new bazaar areas. Special steps should be taken by SEDC to encourage people of all racial communities to enter this type of business.

As an integral part of SEDC's attempts to promote production with a relatively high labour content and, accordingly, a relatively high production value, it should also encourage export of these products in order to build up markets sufficiently large to establish economically viable enterprises. Products which could be developed for export would include among others:

- well designed, strong and practical knock-down furniture,
- prefabricated wooden houses,
- fresh fruit, vegetables and spices,
- processed pork, poultry and beef.

Some of these products will not develop immediately, but may emerge later. However, it is important - in addition to existing specialised organisations such as the Sarawak Pepper Marketing Board - to encourage general export promotion, which could instigate or assist marketing of all types of products. The establishment, expansion and permanent protection of an export market is usually a costly affair, but it may be facilitated through the services of a central organisation - SEDC - and through the following recommended arrangements:-

- strict quality control of export products, so that customers can be sure that Sarawak products are of high and stable quality, and
- a special trade mark, common to all Sarawak products which meet the demands of the quality control.

APPENDIX I

APPENDIX I

I.1 WHEEL LOADER FOR SILICA SAND EXTRACTION

Capacity - Calculation (CAT 920)

Assumed pay loads etc:

- capacity per haul	1.5 tons
- average hauling distance	300 yards
- average haul, dump time	2 x 1 min.
- average scraping time	10 min.
- average glass sand/other material	3/1

Calculation:

Payload = 7.5 tons per hour

7 hours daily = 52.5 tons

52.5 tons x (3/4) (i.e. sand/other material ratio) = 39 tons per day

$$\frac{\text{Operation cost per day}}{\text{Capacity per day}} = \frac{22.3 \times 7}{39} = \$4.00 \text{ per ton}$$

I.2 RAW MATERIALS

Raw Materials	$/ton	Freight	cif Bintulu/ton	Batch 1 tons/100	Batch 2 tons/100	Batch 3 tons/100	cif Bintulu for batch (in $/ton) 1	2	3
Silica	4.50	-	4.50	73.3	70.5	70.1	3.30	3.17	3.15
Boric acid	675	35	710	0.1	-	0.7	.71	-	4.97
Alumina } Ferrus) oxide	300	35	335	1.3	2.1	2.6	4.35	7.03	8.71
Lime	15	10	25	9.1	8.9	5.6	2.28	2.23	1.40
Magnesia	60	35	95	0.2	1.4	3.6	.19	1.33	3.42
Soda	15	35	50	15.4	16.0	16.8	7.70	8.00	8.40
Potash	50	35	85	0.1	0.6	0.3	.09	0.51	0.25
(cullet)	(30)	-	(30)						
Miscellaneous	275	45	320	0.5	0.5	0.5	1.60	1.60	1.60
						Raw materials per ton	20.22	23.87	31.90

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