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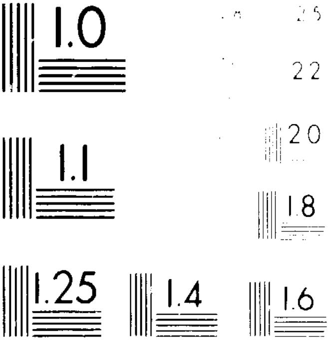
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INDONESIA INDUSTRY SECTOR STUDY*
(UC/INS/82/106)
INDONESIA

Part I. Main Report

Prepared by the

Regional and Country Studies Branch
Division for Industrial Studies

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PREFACE

The Government of Indonesia requested UNIDO in 1982 to undertake a study of the overall prospects for industrial development in Indonesia for the coming 10-15 years and to assess the scope for developing selected groups of capital goods industries based, inter alia, on demand projections. The study would include a review of processing equipment industry within the overall framework of industrial development and provide a basis for subsequent detailed technical and economic studies.

In October 1983, the Government requested further, within the framework of the wider study, a report containing tentative recommendations on the potentials for domestic production of equipment for the following industries: coconut and palm oil, rubber, sugar, cocoa, coffee and tea, textiles, wood and cement.

This preliminary draft report has been prepared by a team consisting of Torben M. Roepstorff (team leader), Atif Kubursi, Peter Manoranjan and Marc Dreyer, following a field mission to Indonesia in October-November 1983. H.W. Arndt contributed some of the analyses and was responsible for much of the final drafting. The Netherlands Economic Institute was consulted on selected issues. K.H. Plätzer constributed much of the material for Parts V and VI. Raman Suri provided research assistance. A final draft is to be presented after discussion with the Government of Indonesia.

The UNIDO INDONESIA INDUSTRY SECTOR STUDY comprises the following six parts:

Part I	Main Report
Part II	Industrial Development in Indonesia - Past Trends and Future Prospects
Part III	Survey of Capital Goods and Engineering Industries
Part IV	Long-Term Projections of Demand for Capital Goods in Indonesia
Part V	Potential for Development of a Selective Capital Goods Industry
Part VI	Capital Goods Production in Developing Countries: International Experience

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Part I Main Report

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Part I. Main Report

Chapter I. Industrial Development in Indonesia: Past Trends and Future Prospects

1.1 Recent Economic Development in Indonesia

The decade and a half since 1968 have been a period of rapid and sustained economic development in Indonesia such as few would have thought likely or possible in the 1950s or early 1960s. Following the change of regime in 1966, the country's tremendous economic problems were energetically tackled. Beginning with measures of stabilisation and rehabilitation, economic policy makers from 1969 on aimed at resumption of long-term economic development. The first Five Year Plan (1969-74) gave top priority to agriculture and especially rice production. The following two Plans shifted the emphasis towards broader economic, industrial and social development.

Indonesia was fortunate in two respects. First, the policy emphasis on rice production coincided with the "green revolution" in rice, the development of high-yielding and fast-maturing varieties. Taking advantage of this opportunity, a wide-ranging programme of "rice intensification", including fertiliser, irrigation, pesticides, rural credit and extension, contributed to an annual rate of growth of rice production averaging 5 per cent over 13 years (1968-81). This not only raised living standards directly but also contributed to general economic development by widening the market for manufactures and services and generating employment opportunities.

Secondly, the two OPEC oil price increases of 1973-74 and 1979-80 for a decade freed Indonesia from the balance of payments difficulties which had constrained her economic development during the 1950s and 1960s. Very large oil earnings, in foreign exchange and (in the form of oil company tax) government revenue, suddenly became available to finance economic and social development projects, both directly and by enhancing Indonesia's international credit standing. The two oil booms were not an unalloyed blessing. They led to some imprudent developments, of which the Pertamina crisis of 1975 was the most conspicuous example, and by raising the real effective exchange rate put severe pressure on the country's non-oil traded goods industries. While manufacturing industries producing for the domestic market derived some compensating benefit from rising domestic demand and from tariff and other protection, non-oil exporters, both of cash crops and manufactures, bore the brunt. The two devaluations of the rupiah, in November 1978 and March 1983, were partially intended to give relief to these industries.

The overall performance of the Indonesian economy during the 1970s is illustrated by Table I.1. The average GDP growth rate of 8 per cent compared well even with the other fast-growing countries of east Asia. The inflation rate fluctuated with the two oil booms but was kept within tolerable bounds by prudent macroeconomic policies. The rise in the investment ratio from 9 to 21 per cent, and of the tax ratio from 8 to 24 per cent, during the period 1968-81, serves to indicate the notable economic development that has taken place. But much of this development, especially of the rapidly growing modern manufacturing sector, has been relatively capital intensive. It has therefore contributed relatively little to the enormous task of providing productive employment for a largely underemployed work force growing by 2 million new entrants a year.

In the past two years, adverse trends in the world economy - the prolonged recession in the OECD countries and the turnaround in the world oil market - have seriously worsened Indonesia's short and medium term economic prospects. For some time, there had been concern about Indonesia's capacity to maintain the volume of oil exports because of rapid growth of domestic demand for oil products at subsidised prices. The decline in the real price of crude oil in world markets which began in 1981 has greatly aggravated the problem. A balance of payments surplus of US $ 2 billion in 1980-81 turned into a deficit of nearly US $ 3 billion in 1981-82 and nearly US $ 7 billion in 1982-83, and there was a sharp fall in oil tax revenue.

The government has taken prompt action to deal with the immediate crisis. Public sector wages and salaries have been frozen, public investment projects drastically pruned, oil and food price subsidies cut, the rupiah devalued (thus offsetting the fall in oil tax revenue and giving price incentives to non-oil export industries), the banking system partially deregulated and a tax reform prepared to stimulate domestic resource

Table I.1 Indicators of economic performance, Indonesia, 1968-81
(Percentage)

Year	GDP Growth Rate	Inflation Rate	Growth of Output				Investment	Tax
			Rice	Food	Agriculture	Crude Oil	GDP Ratio	GDP Ratio
1968	13.9	85	12.5	9.1	6.9	18.0	9	8
1969	9.0	10	5.1	1.0	1.1	23.3	12	9
1970	10.9	9	6.5	3.5	4.2	15.1	14	10
1971	6.5	2	4.7	3.4	4.0	4.3	15	11
1972	9.4	27	-3.6	1.1	2.1	21.3	19	13
1973	6.8	27	10.6	7.0	3.7	23.8	18	15
1974	7.6	33	4.7	6.9	3.7	2.8	17	16
1975	5.0	20	-0.6	0.9	0.0	-5.0	20	18
1976	6.9	14	3.9	3.5	4.7	15.3	21	19
1977	8.8	11	0.1	-1.2	1.6	11.7	20	19
1978	6.8	8	10.1	9.6	7.2	-2.9	21	19
1979	5.3	20	2.3	4.0	3.8	-2.6	21	21
1980	9.6	16	12.8	8.6	5.2	-1.1	22	24
1981	7.6	7	10.4	8.1	3.5	1.6	21	24
Annual Average 1968/81	8.2	20.1	5.1	4.0	3.4	7.8		

Source: Central Statistical Bureau.

mobilisation. But Indonesia clearly faces leaner years. There is little reason to believe that world oil prices will rise in real terms before the end of the 1980s, and while LNG exports will help fill the gap, exportable surpluses of oil will inevitably decline and may disappear by the end of the century. The fourth Five Year Plan, commencing on 1 April 1984, envisages annual growth rates of GDP and manufacturing of 5 per cent and 9.5 per cent respectively, a good deal below those achieved during the 1970s; yet even these will strain available external and domestic resources.

In order to keep external borrowing and debt within acceptable limits, it will be essential to promote non-oil exports and, where it can be achieved reasonable economically, further import substitution. At the same time, the pattern of economic development must give high priority to the generation of productive employment opportunities. For both these reasons, Indonesia's economic future depends crucially on an appropriate and efficient pattern of industrial development. The main burden of providing the jobs will inevitably fall on the service sector. But manufacturing can and must make a contribution.

1.2 The Industry Sector: Past Performance

Although officially designated a "lower middle income" country, Indonesia remains industrially relatively underdeveloped. In 1980, the contribution of large and medium manufacturing to GDP was only 10.3 per cent.[1/] Among large developing countries, only Bangladesh and Nigeria had smaller manufacturing sectors. However, Indonesia's manufacturing sector grew rapidly during the 1970s from a small base (only 6.8 per cent of GDP in 1970). In absolute terms of total value added, Indonesia now has a manufacturing sector of considerable size, exceeded among Asian developing countries only by the People's Republic of China, India, the Republic of Korea and the Philippines.

The new industrial policies adopted by the Soeharto Government after 1966 dramatically improved the climate for industrial growth, by liberalising foreign exchange and trade and by encouraging domestic and foreign private investment, while the oil booms provided resources for massive public sector investment. As a result, manufacturing showed the highest rate of growth, next to construction, among the major sectors of the economy during the 1970s, a rate (12.3 per cent) exceeded only by few developing countries (Table I.2). In the latter half of the decade, growth slowed down somewhat, as the oil boom reduced the international competitiveness of non-oil traded goods production and as the easy stage of import substitution was gradually coming to an end.

The high rate of industrial growth during the 1970s greatly diversified the structure of the Indonesian manufacturing sector. Some of the larger traditional branches, food processing, textiles, beverages and tobacco, grew more slowly, while others grew from nothing or very small beginnings, among them iron and steel, cement, rubber and engineering industries. Medium growth rates were recorded by industrial chemicals (chiefly urea), saw-milling, glass and paper products (Table I.3). Many of these fast growing industries were relatively capital intensive. This also applied to large projects in the petroleum sector, such as oil refineries and LNG plants, which are not included in these statistics. Divergent rates of growth among branches brought substantial changes in the composition of the manufacturing sector,

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1/ Unless otherwise indicated, manufacturing refers to the modern organised sector of large and medium-scale enterprise with more than 20 employees.

Table I.2: Indonesia's average annual rate of growth of GDP and various sectors 1960-1980
(based on constant 1975 prices in US $)

	1960-65	1965-70	1970-75	1975-80	1960-70	1970-80	1960-80
Agriculture	1.1	2.8	3.5	4.3	2.0	3.9	2.9
Mining and quarrying	1.8	11.3	9.5	5.0	6.4	7.3	6.9
Manufacturing	1.5	7.3	14.2	10.6	4.4	12.3	8.3
Utilities	8.8	12.8	12.7	11.5	10.8	12.1	11.5
Construction	-1.6	14.4	20.5	11.4	6.1	15.9	10.9
Services	2.8	5.3	9.8	9.6	4.0	9.7	6.8
Gross domestic product	1.7	5.6	8.2	7.4	3.6	7.8	5.7

Source: UNIDO Data Base, information supplied by the United Nations Statistical Office with estimates by the UNIDO secretariat.

with a marked decline in the relative importance of food processing and textiles in favour of chemical, wood and metal working industries. One feature of this structural change was a substantial shift from single-use consumer goods towards consumer durables, capital goods and intermediate products.

A striking characteristic of Indonesia's industrial development so far has been its almost complete orientation to the domestic market. Despite efforts to encourage exports of labour-intensive manufactures which showed some results in 1978-79 and again in 1982-83 in increased exports of garments, electronic products and recently plywood, manufactured products (i.e. containing substantial value added by manufacturing) accounted in 1980 for only about 2 per cent of total Indonesian exports. Industrial growth has met expanding domestic demand and replaced imports. Import substitution has in the past decade considerably reduced the share of imports in the Indonesian market of urea and paper and has virtually eliminated imports of wheat flour, cotton yarn and fabrics, caustic soda and insecticides. Indonesia is almost self-sufficient in most food products (sugar and temporarily still rice being the most important exceptions), in textiles and oil products. But she continues to rely on imports for most chemical and metallic intermediate products, including components for assembly, and for most producer capital goods. Domestic production of the latter is limited, though expanding.

Table I.3: Manufacturing value added by branch of industry ranked according to average annual growth 1971-1980
(based on values in 1975 US $ constant prices)

ISIC		Average annual growth rate
		Percentage
	- High growth -	
3710	Iron and steel	50.2
3560	Plastic products	33.2 a/
3230	Leather products	31.5 a/
3830	Machinery electri	30.8
3690	Other non-metallic mineral products	28.7
3820	Machinery, except electrical	27.6 a/
3420	Printing and publishing	24.3 a/
3550	Rubber products	22.8
3810	Fabricated metal products	20.2
	- Medium growth -	
3510	Industrial chemcials	18.9
3320	Furniture, except metal	18.7 a/
3310	Wood products, except furniture	17.6
3620	Glass and products	17.4
3410	Paper and paper products	16.1
3110	Food products	14.1
3220	Wearing apparel, except footwear	12.6 a/
3850	Professional and scientific equipment	12.0 a/
3900	Other manufactured products	12.0 a/
3210	Textiles	11.8
	-Low growth -	
3240	Footwear, except rubber or plastic	10.1
3130	Beverages	9.7
3140	Tobacco	9.4
3530	Petroleum refineries	8.0
3840	Transport equipment	5.6
3520	Other chemcials	3.2
Total manufacturing		11.8

Source: UNIDO Data Base, information supplied by the United Nations Statistical Office, with estimates by the UNIDO secretariat.

a/ 1971-76.

While value added in large and medium-scale manufacturing grew during the 1970s at an average annual rate of over 12 per cent, employment rose by only 7 per cent a year, from 487,000 in 1970 to 963,000 in 1980. The difference reflects a significant growth in labour productivity, but it also indicates the failure of manufacturing growth to have much of a direct effect on

Indonesia's employment problem. The increase in the number of jobs created in large and medium-scale manufacturing of 0.5 million during the decade represents only one-fifth of the average annual increase in Indonesia's labour force during the period. Indirectly, of course, through the stimulus it has given to transport and other service industries, industrial growth has undoubtedly generated additional employment opportunities.

Growth of labour productivity has been very high in some of the very capital intensive branches of industry, such as cement, non-electrical machinery, fabricated metals and industrial chemicals, and was likely to be even higher in the large capital intensive developments planned in the late 1970s, in petroleum refining, LNG trains, iron and steel, and non-ferrous metal smelting. The latter industries, as might be expected, also show the highest levels of labour productivity, while labour productivity remains very low in the more labour intensive industries, such as textiles and garments, furniture, potteries and metal fabrication.

The latest available statistics on the geographical distribution of Indonesian manufacturing, those from the 1974-75 Census of Industry, show that Java then accounted for 85 per cent of all medium and large-scale enterprises and 83 per cent of value added. Sumatra had another 12 per cent of value added, leaving only 5 per cent for all the rest of the country. Since then industrial development based on the oil, natural gas, timber and other natural resources of the outer islands may have shifted the distribution in terms of value added (though hardly of employment) somewhat in their favour. But it remains true that Java is much more industrialised than the other regions, primarily owing to better transport and other infrastructure, government and services, although concentration of industry in turn promotes concentration of infrastructure investment and service industries. Government policies aim at promoting industrial development in the outer islands. Four major industrial growth regions outside Java have been identified and industrial estates are being developed in some of them.

Since the passing of the Foreign Investment Law of 1967, there has been a good deal of foreign investment in Indonesian manufacturing, with Japanese capital in the lead. Taking the large and medium-scale manufacturing sector as a whole, private domestic enterprises still dominate ownership, accounting (in 1974-75) for almost one-half of value added. But they were heavily concentrated in the traditional medium-sized industries. In the past decade the relative importance of state enterprises, multinationals and joint ventures has increased considerably, especially in the large-scale heavy industry sector.

Besides the large and medium-scale manufacturing sector with which this report is mainly concerned, there remains a huge and diffuse sector of small-scale and household or cottage industry. While it accounts for little more than one-fifth of value added in manufacturing, it is overwhelmingly more important in terms of employment. According to the official statistics (which have many weaknesses), small-scale and household-cottage industry accounted together for 87 per cent of total manufacturing employment in 1974-75 and for 80 per cent in 1979 (the apparent decline being largely accounted for by change of statistical coverage, in particular exclusion of all but regular workers). A large proportion of workers in household industry are family workers working part-time and intermittently.

The extreme heterogeneity of manufacturing industry in Indonesia - one can almost speak of dualism - poses a dilemma for policy makers. Employment and anti-poverty objectives suggest the allocation of considerable effort and resources to the household sector, while growth objectives are more likely to be served by concentrating on the larger firms in the modern sectors. Even in relation to production of capital goods, the small-scale and household-cottage sector is not entirely negligible. There is significant production of metal products, such as hand tools and small agricultural machines, as well as vehicle components and repair, which needs to be borne in mind in any policy consideration of the capital goods sector.

1.3 The Industry Sector: Prospects

1.3.1 Demand for Manufactured Products.

Demand for the products of Indonesia's manufacturing sector is determined by three factors. One is the size and composition of total domestic demand for manufactures. The second is the relative share of imports in the domestic market for manufactures. The third is the size and composition of manufactured exports. The second and third of these will depend on the development of the comparative advantage enjoyed by Indonesian manufacturing industries relative to their foreign competitors. The prospects for the Indonesian manufacturing sector over the next decade are conveniently examined by considering first the growth prospects for the manufacturing sector as a whole and then prospective changes in comparative advantage and in the composition of domestic demand for manufactures.

The fourth Five-year Plan assumes annual rates of growth of GDP and manufacturing of 5 per cent and 9.5 per cent respectively. Two questions may be asked about the implications of such a growth rate for the manufacturing sector. First, will such a rate of growth of GDP be sufficient to absorb the growth in Indonesia's labour force? Secondly, will domestic demand grow at a rate sufficient to absorb the output generated by the rate of growth of the manufacturing sector implied in such an overall growth rate?

During the period 1971-80 manufacturing employment and output grew at an annual rate of 5.3 and 14.9 per cent, as compared with 3.0 and 8.1 per cent for the economy as a whole. These figures imply an employment elasticity with respect to output growth of 0.36 for manufacturing and 0.37 for the whole economy. During the 1980s the labour force, assuming an unchanged participation rate, is expected to grow at an annual rate of 2.6 per cent. A 5 per cent rate of growth of GDP, with an unchanged employment elasticity of0.37, would yield an increase in employment at an annual rate of only 1.9 per cent. To meet the minimum target growth rate of employment of 2.6 would require either a growth rate of GDP of 7 per cent or an increase in the employment elasticity to 0.52 per cent. Some increase might result in any case from a decline in the relative importance of the oil sector. The elasticity could be further raised by policies to encourage labour-intensive manufacturing, including small-scale industry.

Experience of other developing countries at Indonesia's present stage of development suggests an elasticity of manufacturing output growth with respect to GDP growth of 1.5 per cent, and there are reasons to believe that some such relationship will hold for Indonesia in the 1980s. In other words, for GDP to grow at 5 per cent, manufacturing output must grow at 7.5 per cent. However, between 1975 and 1980, while GDP grew at an annual rate of 7.5 per cent, domestic demand for manufacturing grew at 10 per cent, giving an income elasticity of demand for manufacturing of only about 1.3. If this value holds during the 1980s, a growth rate of GDP of 5 per cent would yield a rate of growth of the domestic market of only 6.5 per cent, not enough to absorb the hypothesised output growth of 7.5 per cent. To ensure an adequate growth of demand, the gap must be filled either by further import substitution or by a sufficiently high rate of growth of exports of manufactures. For employment reasons, an export oriented strategy is likely to be preferable.

For the purpose of projecting prospects and indicating policy options during the 1980s for the manufaturing sector in general and the capital goods industries in particular, an intermediate assumption of a growth rate of GDP of 6 per cent has been made in this study. Given the same elasticity of manufacturing output growth (1.5 per cent), this would imply an annual growth rate of manufacturing output of 9 per cent. To absorb this output, given an income elasticity of demand for manufactures of only 1.3, even more emphasis on import substitution and/or export promotion will be needed. On the other hand, the more ambitious GDP growth rate target would, with an unchanged employment elasticity of 0.37, get closer (2.2 per cent) to the projected growth rate of the labour force of 2.6 per cent.

To make reliable projections of any country's future comparative advantage at a disaggregated level is hardly possible. But it may be helpful in assessing the likely trends in the pattern of Indonesia's future comparative advantage in manufacturing to draw on the experience of other developing countries.

The first generation, after Japan, of the newly industrializing countries of east Asia (NICs) which achieved spectacular growth of exports of labour-intensive manufactures in the 1960s and early 1970s have since around 1975 embarked on a transition from labour to capital and skill intensive products. Their success in this strategy will be relevant to Indonesia because it will influence the extent to which markets for labour intensive products will be vacated. But in seeking export markets for such products, Indonesia may encounter formidable competition from a new generation of industrialising countries, such as the People's Republic of China and the countries of south Asia.

Four sets of data on the manufacturing exports performance of developing countries may help throw further light on the characteristics of manufacturing industries in which Indonesia is most likely to have a comparative advantage.

The first shows that the share of resource-based exports declines with the stage of economic development. The comparative advantage due to high levels of total factor (capital plus labour) productivity which the more highly industrialised countries obtain from their endowment with human capital (skills, management, technology), less developed countries are most likely to derive from endowment with natural resources. Indonesia is still clearly in the latter category.

The second set of data compares levels of wages and labour productivity in selected industries in Malaysia, the Philippines and Indonesia. It shows that wages levels in Indonesia were very much lower than in Malaysia and only two-fifths even of those in the Philippines. But the potential comparative advantage which Indonesian manufacturers might have enjoyed on account of low wages was largely offset, and in some industries outweighed, by low levels of labour productivity. While lower capital intensity of production may explain some of the differences in labour productivity, the most likely explanation is found in other factors, such as lower average levels of skill, management and organisation of production for which the regulatory environment may be partially responsible.

The third set of data examines the relative success of developing countries in increasing their share of imports of various manufactures into the USA and other developed countries. While miscellaneous manufactures (SITC 8), among others, have done well, manufactured goods (SITC 6) and machinery and transport equipment (SITC 7) have tended to do badly.

Finally, data from a UNIDO study of 134 manufacturing industries from three country samples during the years 1966-75 have been classified according to the product characteristics of non-resource-based industries. The classification rests on the hypothesis that comparative advantage in exports of manufactures depends, apart from differences in factor proportions, chiefly on skill requirements and on the degree to which the production process is standardised (in the sense that developed countries are more likely to have a comparative advantage in products requiring quick adaptation in response to changes in demand). The data indicate a range of non-resource-based manufactures in which Indonesia is most likely to have a comparative advantage because of relatively high labour intensity, relatively low skill requirements and a relatively high degree of standardization.

Domestic demand for manufactures is primarily influenced by population growth and by changes in income. A UNIDO report[1/] identifies growth elasticities (with respect to per capita GDP) and size elasticities (with respect to population) of value added per capita for 3-digit ISIC industries from cross section data for large countries, including developed and developing. They suggest that increases in market size have little effect on production in most cases. Branches for which market size matters because large production runs and economies of scale are important include machinery, professional equipment, iron and steel and chemicals. Other things being equal, these are industry branches in which Indonesia, because of the large size of its domestic market, might have a certain advantage as compared with small countries at a similar stage of development. The highest growth elasticities, as might be expected, occur in the more capital intensive industries producing intermediate products and capital goods.

1.3.2. Priorities in Industrial Strategy.

Since 1969, there have been significant changes in objectives of industrial development included in Indonesia's Five-year Plans (Repelita), from emphasis on industries ancillary to agriculture in Repelita I to emphasis on social objectives (especially employment and protection of pribumi entrepreneurs) in Repelita II, and broad-based industrial development on the basis of domestic oil, mineral, timber and other natural resources, as well as of labour intensive manufactures for export, in Repelita III. For the fourth Plan, it is envisaged that manufacturing should take the place of the oil sector as the main engine of growth, contributing an increasing proportion of value added, net foreign exchange earnings and employment. Promotion of machinery and export industries is to receive high priority, but there are also plans for further import substitution, especially in the processing of raw materials into intermediate products for downstream manufactures.

In view of the important role of small-scale industry in Indonesia in creating employment, and its prevalence in rural areas and regional dispersion, strategies of industrial development should include assistance to

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1/ UNIDO: Industry in a Changing World, (United Nations publication, sales No. E.83.II.B.6).

this sector in overcoming its many problems - low productivity, intermittent employment, financing, marketing, quality control, managerial and others.

The options open to Indonesian policy makers concerned with industrial development can usefully be examined in an analytical framework of two alternative broad strategies. The first aims to reduce Indonesia's dependence on world markets and imports. It emphasizes the development of manufacturing industries producing for the domestic market for consumer goods, capital goods and intermediate products. In so far as it relies heavily on import substitution, it may be called an inward-looking strategy, or alternatively one of self-reliance. The second strategy focuses on the development of industries in which Indonesia can be expected to have a comparative advantage in international trade. It tends to emphasize labour intensive industries, export promotion and small-scale enterprise. It can be called an outward-looking or labour intensive strategy.

Growth prospects for different industries can be projected for the first strategy on the basis of a continuation of the historical pattern in Indonesia and the experience of another large country which adopted such a strategy, Brazil in the 1960s. In the specification of growth elasticities for the second strategy, the experience of export-oriented industrializing countries, such as the Republic of Korea (in the late 1960s and early 1970s) and Malaysia is a useful guide.

In assessing the economic effects of industrial development under the two alternative strategies, it is important to take into account not only the direct effects on value added and employment in each industry, but also the indirect effects on output and employment in industries using that industry's products (forward linkages) and industries supplying inputs to that industry (backward linkages), as shown by input-output relationships. Forward linkages imply an assured market. Backward linkages imply that growth of the industry may give a stimulus to supplier industries. But large linkages present only a *prima facie* case for expansion of an industry. While establishment or expansion of an industry may help user and supplier industries if it produces its products efficiently (i.e. cheaply, quality for quality), it would affect them adversely if it could operate only under cover of high rates of effective protection from imports.

Comparison of the direct and indirect economic effects of industrial development under the two strategies, in terms of labour-output ratios to measure relative labour intensity, and of skilled man-years per unit of output and non-wage value added per worker as proxies for the use of human and physical capital, yields a number of interesting findings which are presented in Table I.4.

Table I.4 Summary results strategy A (inward looking strategy) and B (outward looking/labour intensive strategy)

Summary results	Increments 1980-1990	
	Strategy A	Strategy B
Production (Rp. billion)	22,191	22,191
Employment (thousands of persons)	1,785	2,531
Investment (Rp. billion)	32,688	22,462
Value added (Rp. billion)	6,670	6,535
Imports of inputs (Rp. billion)	7,878	6,903
Incremental ratios:		
Capital-output	1.5	1.0
Capital-value added	4.9	3.4
Efficiency of capital (value added capital)	0.20	0.29
Capital-labour (Rp. million)	18.3	8.9
Value added-labour (Rp. million)	3.7	2.6

Source: Part II, Chapter 4.3.

As might be expected, because of its emphasis on relatively labour intensive industries, it is the second (export-oriented) strategy which has the more favourable effects on employment, even when the same labour intensities are assumed in each industry under the two strategies. Not surprisingly, the first strategy has much the larger capital requirements also, 30 per cent larger than those of the second strategy. Most striking is the finding that, despite its emphasis on import substitution, the first strategy has the higher import requirements, 36 per cent of the value of production, as compared with 31 per cent for the second strategy.

To some extent, it should be possible to mix elements of both strategies. A larger employment effect and contribution to net foreign exchange earnings can be expected from emphasis on labour intensive and export industries. But certain capital intensive industries may provide a more balanced industrial structure, a stronger base for long-term development and technological deepening. The large size of the country may justify the establishment of some large scale industries dependent on economies of scale that would not be viable in a small country. Other things being equal, the case for such an industry or project is stronger if the initial investment can be financed by external capital which would not otherwise be forthcoming. Even here, however, selection needs to be based on sound economic criteria, carefully weighing economic costs and benefits.

A selective approach to import substitution can be blended into a labour-intensive strategy by focusing on industries in which Indonesia is likely to have a comparative advantage in the longer run, thus minimising the need for longer-term protection. The most favourable prospects here are among simple engineering products, especially for processing equiment. The development of labour intensive and resource based industries also has important implications for regional development. While labour intensive industrial development will continue to be concentrated in Java, the processing industries will largely be located in the outer islands where the natural resources are found. In some cases, these may also support economic processing equipment producing industries.

Chapter II. Survey of Capital Goods and Engineering Industries

2.1 An Overview

Capital goods production constitutes an important part of the engineering industry sector classified under ISIC 38 "fabricated metal products, machinery and equipment". The sector includes five main industrial groups: fabricated metal products (ISIC 381); machinery, except electrical (382); electrical machinery (383); transport equipment (384); professional, scientific and photographic equipment (385). The engineering industry includes manufacture of intermediate products, parts and components as well as assembly operations. One of the most heterogeneous branches of manufacturing, the engineering sector produces consumer durables (such as radios, TV sets, motor cars and cycles), intermediate goods (such as steel rods and components for assembly) and capital goods (such as machinery). The distinction between consumer durables and capital goods is not clear-cut since some products, such as sewing machines, are used both by households and industry. But the distinction is important because market conditions and production processes may be very different for products meeting consumer or investment demand.

Indonesian industrial statistics do not permit an exact statistical definition of capital goods. But broad estimates, derived from the provisional 1980 input-output table, indicate the distribution of capital goods, intermediate products and consumer durables production for the major branches of engineering industries (Table II.1). They show that a high proportion of the output of engineering industries (50.3 per cent) consisted of intermediate goods, followed by capital goods (28.2 per cent) and consumer durables (21.5 per cent). This chapter focuses, after an initial survey of the engineering sector as a whole, on those branches which produce most capital goods, i.e. non-electrical machinery and equipment, electrical machinery and metal products. Emphasis will be placed on capital goods for industrial use, and especially plant processing equipment for raw materials from agriculture and forestry. Some information is also provided on the ironand steel sector (ISIC 371) which supplies part of an important raw material for the engineering sector.

Table II.1: Component shares of domestically produced goods, 1980

		Intermediate output	Private consumption	Government consumption	Gross fixed capital formation	Change in stock	Exports	Total production
381	Metal products	71.59	7.78	2.48	18.53	-1.03	0.66	100.0
382,383	Machinery, repair	39.02	11.67	5.93	19.39	15.36	8.73	100.0
384	Transport equipment	33.92	20.28	7.76	37.19	0.69	0.16	100.0

Source: Provisional Input-output Tables, 1980.

2.2 Overall Performance

The capital goods and engineering sector was one of the fastest growing branches of Indonesian manufacturing industry during the 1970s, admittedly from a small base. Table II.2 shows particularly high growth of value added for the electrical machinery sector (chiefly electronic products). Rapid growth raised the share of engineering goods in total manufacturing value added from 6.1 per cent in 1970 to 16.9 per cent in 1980. Assuming, as Table II.1 suggests, that capital goods accounted for 28.2 per cent of engineering sector output, the share of capital goods in total manufacturing output in 1980 can be put at about 5 per cent. An embryonic capital goods industry has emerged.

Among the major branches of the engineering sector, the transport equipment sector was the largest (6.4 per cent of total manufacturing value added), followed by electrical machinery (5.3 per cent) and metal products (3.5 per cent). The share of non-electrical machinery (1.6 per cent) lagged behind, and production of plant equipment included in this category was still very small.

Because much of it was relatively labour-intensive, the engineering industry made a relatively substantial contribution to employment creation within the manufacturing sector. Employment in large and medium scale engineering industry grew during 1971-80 at an average annual rate of 15.8 per cent. In absolute terms, employment increased by some 93,000, from 28,000 in

Table II.2: Value added, employment and labour productivity in capital goods and engineering industries 1970-1980

ISIC	Average annual growth 1971-1980: MVA	Average annual growth 1971-1980: Employment	Share of value added in total manufacturing 1971	Share of value added in total manufacturing 1980	Share of Employment in total manufacturing 1970	Share of Employment in total manufacturing 1980	Value added per employee 1980 (000 US $)	Contribution to overall employment growth of total manufacturing 1970-80
381 fabricated metal products	20.2	11.5	2.3	3.5	2.8	4.2	2.9	5.7
382 Machinery, except electrical	19.5	10.5	0 4	1.6	0.9	1.2	4.5	1.6
383 Electrical machinery	30.8	27.1	2.5	5.3	0.7	3.9	4.8	7.1
384 Transport equipment	5.6	16.6	0.9	6.4	1.3	3.1	7.3	5.1
385 Scientific and professional equip.	12.0 a/	-	0.0	0.1	0.0	0.1	2.2	2.1
ISIC 38 sub-total	17.6	15.8	6.1	16.9	5.8	12.6	4.7	21.6
Total manufac.	11.8	7.1	100.0	100.0	100.0	100.0		100.0

Source: Part III Table II.1.
a/ 1971-1976.

1970 to 121,000 in 1980. In the electrical machinery branch, the rate of growth of employment was 27 per cent per annum.

Around 86 per cent of all large and medium engineering enterprises were (1979) located in Java and most of the rest in northern Sumatra. Average plant size has risen in recent years and is particular large in the electrical machinery branch, with its large-scale assembly operations. But it is noteworthy that, outside the large and medium scale sector, there is substantial production, particularly of metal products (furniture, hand tools, cutlery, screws and bolts, etc.), by small-scale and household enterprises throughout the country. Their contribution might well be enhanced by sub-contracting arrangements. Non-pribumi private ownership predominates in all engineering industries (reaching 50 per cent in the electrical machinery branch, according to one sample survey), followed by private pribumi enterprises which are relatively most important in the transport equipment sector. Foreign investment in the engineering sector has been quite significant, with some $500 million of realised investment by 1981, chiefly in assembly operations.

In 1980 close to two-fifths of total manufactured imports consisted of imports of machinery and equipment. Exports of engineering products are extremely limited, confined to electronic products worth about $108 million in 1980 or 3.7 per cent of exports of manufactures. The share of imports in apparent domestic consumption of machinery and equipment is very high, estimated at 66 per cent, domestic production acounting for only 34 per cent. Since much of present engineering production consists of assembly operations, import dependence is particularly high for parts and components and other inputs. In 1980 imports accounted for 79 per cent of the raw material and components requirements of the engineering sector (Table II.3). Import dependence was particularly high for batteries, communications equipment, non-electrical machinery, structural metal products and metal containers. But there were also a few products of which domestic production provided more than one-half of all raw material requirements, among them repairs of electrical equipment; cutlery, screws and bolts; bicycle and becak assembly; and shipbuilding and repair.

2.3 Review of Key Capital Goods Industries

The non-electrical machinery branch, although still a relatively small one, is of greatest potential interest in relation to production of capital goods. Among its sub-groups are engines and turbines, agricultural machinery and equipment, metal and wood working machinery and office equipment. The branch has lagged behind the growth of the rest of the engineering sector since 1975, so that its share in value added and employment has declined. The reasons for this can be traced to meagre investment, presumably reflecting problems connected with shortage of skilled labour, management and marketing expertise and technical knowhow. Very few enterprises have the capacity to

Table II.3: Reliance on imported raw materials, ISIC (38) engineering industries, 1980

ISIC		Imported Raw Materials and Components in Percentage of Total Raw Materials
37100	Iron and Steel Basic Industry	
38111	Agriculture, hand tools	60.0
38112	Cutlery, screws, bolts	20.3
38113	Kitchen apparatus	65.6
38120	Metal furniture and fixture	37.6
38130	Structural metal products	86.6
38140	Metal containers	81.9
38190	Metal products n.e.c.	61.4
38200	Machinery and repair	82.6
38311	Storage batteries	96.1
38312	Dry cell batteries	89.7
38320	Radio, TV, communication equip.	87.9
38330	Elec. apparatur/supplies	75.2
38340	Repair of elec. appl.	18.2
38411	Shipbuilding and repair	45.4
38430	Motor vehicles ass./manu.	81.2
38440	Motor cycle/3 wheel veh.	64.7
38450	Bicycle, becak ass./manu.	49.7
38460	Motor vehicle body + equipment	57.5
38490	Transport equip. n.e.c.	59.2
38500	Manufacture of scientific equip.	34.9
38	Metal products, machinery and equipment	76.1

Source: Survey of Industries, BPS, Indonesia, Vol. II, 1980.

manufacture complete products or parts. Castings are generally of poor quality and production is greatly dependent on imported components.

Table II.4 shows the beginnings of an industry producing plant and equipment for agricultural processing, including such items as sugar cane milling, coffee milling, tea processing, corn grinding and rice press machines. Most production processes amount to assembly using imported parts. Machinery used is often old and technology traditional. In contrast to the other major branches, average size of enterprise in this branch is relatively small, with an average (in large and medium size firms) of 99 employees. Ownership is shared in almost equal parts between pribumi and non-pribumi, foreign and government owners. There are virtually no exports. The effective rate of protection is relatively low (18 per cent). If the rapidly growing demand for non-electrical machinery products in Indonesia is to be met to an increasing extent from domestic production, improvements in product quality, technological capability, competitiveness, management and marketing skills are essential.

The most important sub-sectors of the electrical machinery branch are communications equipment, electrical cables and transformers, lamps, refrigerators and electronic products, such as radios, TV sets, cassette, tapes, etc. Most of these products are consumer durables, but there is also a large number of potential capital goods products. The electrical machinery branch has shown the highest rates of growth of value added and employment, with moderate growth in labour productivity. Production processes, however, are generally quite up to date, consisting mostly of assembly operations which use unskilled or semi-skilled labour. The majority of enterprises are located in and around Jakarta. They are typically large-scale, with an average of 337 employees. Ownership is predominantly non-pribumi, followed by foreign ownership. Electrical machinery is the only branch that has penetrated export markets, some 14 per cent of its output being exported. The main export product is integrated circuits bond-processed by US companies. Inevitably, in view of its predominantly assembly character, the industry's inputs come almost entirely from abroad, only 8 per cent of raw materials and components being obtained from domestic sources. The finished products are highly protected, with an effective rate estimated at 111 per cent.

The fabricated metal products branch produces a wide range of goods, ranging from agricultural hand tools and equipment, kitchen utensils and furniture, metal containers, screws and bolts, to galvanised products. The branch accounted in 1981 for about 4 per cent of manufacturing employment (44,000 persons). Labour productivity during the 1970s grew almost as rapidly as employment, but its level was still very low in all sub-sections. A significant proportion of employment and output of metal products in Indonesia is still in small-scale and household enterprises spread throughout the major islands. There are virtually no exports and a large proportion of inputs of intermediate products is imported, but there are exceptions, such as cutlery, screws and bolts production where domestic raw materials predominate, and inputs of chemicals (chiefly paints) of which about half are of domestic

Table II.4: Domestic production and repair of non-electric machinery and equipment (ISIC 382) in Indonesia, 1980

Machinery	Unit	Physical Production	Value (000 Rp.)	Unit Value (000 Rp.)
Generator	unit	58,075	26,369,491	454.1
Radiator	unit	130	4,231,169	32,547.5
Stone crusher	ton	102	1,300,500	12,750.0
Generator sets	set	1,645	962,549	585.1
Cranes	unit	37	673,719	18,208.6
Tile press	set	2,578	207,540	80.5
Tile roofing machines	set	206	181,902	883.0
Rice press machines	set	451	175,891	390.0
Tile press machines	set	250	153,000	612.0
Tea processing machines	unit	27	142,598	5,281.4
Mixing machinery	set	37	77,000	2,081.1
Rubber machinery	ton	27	60,937	2,256.9
Sugar cane milling machines	ton	241	58,319	242.0
Brick processing machines	number	1,002	47,600	47.5
Weaving machine apparatus	number	5,205	45,018	8.6
Rubber rollers machines	number	33	35,600	1,078.8
Sondir/special machines	number	24	28,800	1,200.0
Corn grinder mill	number	142	22,120	155.8
Coconut oil milling machines	number	40	21,000	525.0
Brick pressing machine	number	3	17,000	5,666.7
Maize press/roller machines	set	134	16,623	121.8
Tapioca milling machines	set	2	15,000	7,500.0
Moulding machines	number	75	11,250	150.0
Kloss machines	number	15	11,250	750.0
Finishing textile machinery	unit	12	11,100	925.0
Saw machines	unit	1	9,000	9,000.0
Coffee milling	number	33	8,500	257.6
Excenter press machines	number	13	1,500	115.4
Bean curd processing machines	number	7	980	140.0
Chili processing machines	number	2	270	135.0
Other machines	-	-	18,429	-
Total all machines	-	-	34,915,661	-

Source: Survey of Manufacturing Industries, Indonesia, Vol.II, 1980.

origin. Production processes are very diverse, ranging from old factories with outdated technology and low quality products to modern plants. Average capital intensity is low.

2.4 Development Plans

Preliminary planning for Repelita IV accords the engineering industry high priority, with a planned growth rate substantially higher than the 9.5 per cent envisaged for manufacturing as a whole. Special attention will be directed at industries producing industrial machinery, in the hope that Indonesia will increasingly be able to meet its own needs. A sector of particular interest is agricultural and processing machinery. It is this that lends importance to Part V of the present study aimed at identifying opportunities for domestic production of capital goods required for processing of agricultural and forestry products.

During Repelita III, some 52 key projects were proposed for the basic metals, basic chemicals and multifarious industry sectors, with total investment requirements of nearly $12 billion. Among these were 18 projects for the basic metals sector, with total planned investment of US$2.2 billion. Some of these projects were initiated during Repelita III; others are still being negotiated or open for negotiation. Early in 1983, the Government rephased a large number of major public sector projects, but none of the 18 in the basic metals sector appears to be included in the deferred list. Among the 18 projects are several steel fabricating plants for the Cilegon steel complex, as well as factories for the production of diesel engines, railway rolling stock, machine tools, casting and forging blanks, sugar and other processing equipment, heavy electrical machinery, copper cathodes and ship yards.

Planning for Repelita IV also includes estimates of demand and supply for important industrial products at the five-digit ISIC level. Among the major categories for which such estimates have been made are iron and steel, non-ferrous metal (chiefly aluminium), industrial machinery and utensils, heavy duty and construction equipment, agricultural and electrical machinery, commercial vehicles, aircraft, ships and railway rolling stock. For all of these, ambitious targets are being set in terms of investment and output. Both capital goods and materials and components production plans aim primarily at meeting growing domestic demand and import substitution.

Chapter III. Long-term Projections of Demand for Capital Goods in Indonesia

3.1 Some Theoretical Considerations

All economic forecasting is difficult, and forecasting the demand for capital goods particularly so.

Capital goods are required to produce other (consumer, intermediate or capital) goods. For any given technology, a particular stock of fixed capital (e.g. machines) is required to produce a particular annual flow of output of finished products. This relationship underlies the acceleration principle which is often incorporated in forecasts of new investment for expansion of capacity. To the requirements for net investment have to be added those for replacement investment, as determined by depreciation and obsolescence of existing equipment. If the task is to estimate demand for capital goods in the economy as a whole, not merely for individual capital-using industries, there remains the further problem of forecasting future rates of growth of demand for the final products of the whole range of capital-using industries. In an open economy, allowance must also be made for that part of domestic demand for each category that is expected to be met by imports and the addition to domestic demand likely to be made by exports.

If the ultimate purpose of estimates of future demand for capital goods is to guide planning for the establishment of domestic capital goods producing industries, precise estimates of future demand for capital goods are not really necessary for an open economy. All that is needed is to determine, for each type of capital good whether (a) domestic demand is likely to be sufficient for economically efficient (optimum scale) domestic production and, if not, whether (b) there are prospects for exports sufficient to enable domestic production to reach this volume and whether (c) domestic production is likely to be competitive with imports, subject to some maximum rate of effective protection (say, 20 or 30 per cent).

3.2 Capital Goods Demand Forecast: Methodology

With this conceptual framework in mind, an attempt has been made, as far as data constraints permit, to make long-term projections of demand for capital goods in Indonesia. Forecasts of the demand for a selected group of capital goods are generated for the years 1985, 1990 and 2000 under alterntive assumptions about the rate of growth of oil and LNG revenues, the growth of oil and non-oil GDP, and the growth of manufacturing relative to other non-oil sectors.

The methodology combines time series extrapolations of GDP and sectoral shares of GDP with econometrically estimated forecasting equations. These equations relate the demand for particular products to either the current level of overall GDP (a proxy for the ability to import) or to future changes in GDP in the using sector. Thus in the first step GDP components (an 8-sector breakdown) are forecast. In the second step the amounts of capital goods which are required to support the forecast growth of sectoral GDP are computed. The approach follows a middle ground between a detailed econometric model (for which data are not available) and pure time series extrapolation.

The GDP forecasts are broken down into two steps. First, oil and non-oil GDP are forecast separately using econometrically estimated equations which take into account the impact of oil and LNG revenues. In the second step, sectoral shares of non-oil GDP are forecast for seven non-oil sectors, using logistic equations. Multiplication of the non-oil sectoral shares by the level of non-oil GDP yields levels of sectoral GDP for the non-oil sectors. These are the basis for the "Trend" scenarios.

The demand forecasts are generated in terms of current US dollars. In order to convert them to more meaningful constant dollar (1980 US dollar) values, a price index for equipment is forecast from US data. This forecast takes into account the impact of oil prices on capital goods prices.

Oil prices and Indonesian oil production are important factors in determining the forecast values. Three alternative scenarios (labelled High, Medium and Low) for these variables have been used to generate the capital goods demand forecasts. Additional scenarios have been generated by assuming that the manufacturing sector grows more rapidly than indicated by the time trends. These have been labelled the "Off-trend" scenarios and are based on goals established by Indonesian planners. Thus there are six sets of forecast, based on three "Trend" scenarios and three "Off-trend" scenarios.

3.3 Capital Goods Demand Forecast: Results

The results predict that, even under the most pessimistic views of future oil revenues and the growth of manufacturing, there will be substantial growth in the demand for capital goods in Indonesia. Growth in demand over the 1980-85 period is forecast to be somewhat slower than growth over the 1985-1990 and 1990-2000 periods. Growth rates of demand for non-electrical machinery are forecast to average 15.5 per cent over the period 1980-1990 under the Medium Trend scenario. Rates of growth for food processing machinery and pulp and paper machinery are forecast to be 21 per cent and 14.5 per cent, respectively, over this period. Continuation of this rapid growth over the 1990-2000 period leads to forecast levels of capital goods demand which are large enough to support domestic production of many products. The largest demand is for construction and mining machinery, food processing machinery and pulp and paper machinery.

The "Off-trend" scenarios, which feature more rapid growth of manufacturing, lead to forecasts of the demand for capital goods which are substantially higher than those in the "Trend" scenarios. The achievement of a 25 per cent share of manufacturing in total GDP by the year 2000 is forecast to require a growth rate of capital goods demand in excess of 20 per cent, a rate which may well be too high to sustain over a long period.

The forecast results suggest that the demand for capital goods in Indonesia will grow rapidly, leading to domestic demand which can support a substantial domestic capital goods industry. The establishment of such an industry may well be necessary if Indonesia is to achieve the rapid growth of manufacturing desired by her planners.

In order to develop and expand its domestic capital goods industry, Indonesia must undertake careful and detailed planning. Special attention must be paid to the development of a solid engineering infrastructure, to the forward and backward linkages which tie various products together, to efficient scales of production, and to possible co-operation with other neighbouring countries in research, product development and specialization.

Chapter IV Potential for Development of a Selective Capital Goods Industry

4.1 Introduction

The Government of Indonesia, within the context of planning for further development of capital goods production during Repelita IV, has requested UNIDO to report specifically on the potential for domestic production of equipment for the following industries:

1. Coconut oil
2. Palm oil
3. Rubber
4. Sugar
5. Cocoa, coffee, tea
6. Wcod
7. Cement
8. Textiles

UNIDO was asked to address the following questions: Which engineering industries within this group could be developed relatively easily and why? Which types of equipment could be produced domestically, how, where and by whom? Could examples of (say) 25 projects be given which would be promising candidates for promotion? What follow-up studies would be required?

It should be said at the outset that, for lack of data and time, only very tentative and partial answer can be given to these questions at this stage. On many relevant and indeed essential aspects, even of the present situation in Indonesia, the required statistical data have not been available or have proved inadequate.

In general, Repelita IV target figures for output, and hence processing equipment requirements, have been taken as the starting point. But it should be recognised that, even if planning and investment decisions were taken expeditiously, actual production of equipment in the selected industries is most unlikely to become available before Repelita V.

Adequate assessment of the potential for future domestic production of equipment for these industries requires detailed knowledge of current technology and expert assessment of technological trends. Every effort has been made to draw on the expertise of international equipment producers to make the best possible judgements. The most serious difficulty has proved to be that hardly any of the economic data are available which are needed to assess whether domestic production of the many hundreds of items of equipment would not merely be technically possible in Indonesia but would also be economic, in the sense of not requiring very high rates of effective protection from import competition (by tariffs, subsidies or controls) with consequent economic burdens on the Indonesian user industries. All recommendations for the establishment or expansion of equipment producing facilities in this report should therefore be regarded as provisional, subject to confirmation by means of detailed sub-sectoral studies of economic, as contrasted with merely technical, feasibility.

4.2 Criteria for Selection

4.2.1 Processing Industries

Indonesia already has a wide range of industries processing domestically produced raw materials, including staple foods (such as rice), cash crops (such as rubber) and minerals (such as petroleum). Processing may be for export or for the domestic market. If raw materials are at present exported in unprocessed form, a policy of further domestic processing before export is called "export substitution". If a domestically produced raw material is processed abroad for reimport into Indonesia in processed form (e.g. crude oil refined in Singapore or rubber processed abroad for import into Indonesia of the finished product), a policy of domestic processing implies import substitution.

Whether export or import substitution is desirable depends on the prospects for efficient domestic processing. The mere fact that a new industry processes domestically produced raw materials for the domestic market does not, in itself, prove that it represents a more efficient use of scarce resources than some alternative industrial development, but there is a presumption that there will be a saving in transport costs. The presumption is much less in the case of export substitution. The domestic export industry will benefit by improved international competitiveness if domestic processing is efficient (in terms of costs and quality); it will suffer if domestic processing is relatively inefficient. Even in terms of net foreign exchange saving, the effect on the balance of payments may be negative, as in the case of import replacement in shipping if the net effect is higher freight charges which reduce the competitiveness of the country's export industries.

4.2.2 Processing-equipment Producing Industries.

Similar but distinct questions are raised by a policy of import substitution through the domestic production of processing equipment (machinery, etc.). Clearly, there are cases, such as petroleum refining, where the equipment is so capital and technology intensive that its domestic production is beyond the reach of Indonesia at the present stage. But there is a wide range of processing equipment, such as crumb rubber factories or edible oil processing plants, most of the equipment for which is relatively simple, with no very high requirements in terms of skills, capital or technology. The great advantage in selecting such processing equipment for import substitution, in preference to other engineering idustries, is that by assumption a substantial market exists. A large volume of output is produced in Indonesia by the user industries and most of this output requires machinery-using processing. Future demand prospects depend on the expected rate of growth of demand and productive capacity for the product and on replacement demand as existing processing equipment wears out.

Here again, there is no certainty that import-replacement will be an economic proposition. If a new domestic equipment-producing industry (e.g. producing rice mills or crumb rubber plants) is uncompetitive with imports in price and/or quality, the effects on the raw material (rice or rubber) producing industries may be disastrous. Conversely, if the new industry is able to adapt equipment knowledgeably to the special requirements of the domestic raw materials and the tastes and needs of (foreign and domestic) markets, it may benefit the agricultual sector.

There are some considerations, often called "developmental" or "social" (although economists would prefer to think of them as involving externalities) which may reasonably modify conclusions reached on the basis of the preceding criteria. Among them are "learning by doing", backward and forward "linkages" of domestic equipment production, better adaptation of equipment to domestic factor proportions, employment effects and location for regional development. There is no doubt that such externalities may justify, from a longer-term social point of view, investment that would not appear economic in the short run or attractive to private investors. But the uncertainty of such external effects, and the virtual impossibility of quantifying them, make reliance on them as a guide to investment decisions dangerous - at best an act of faith, at worst an excuse for malinvestment of scarce capital and protection of vested interests.

4.3 Indonesia's Present Processing-equipment Producing Industry: Inadequacies and Constraints

Some of the metal working enterprises in Surabaya, Jakarta, Bandung and Medan that are either already producing equipment or spare parts for processing industries or have the potential to do so, were visited by a UNIDO mission in October/November 1983 in order to assess their current capability. The most striking impression was that most of the machine tools and other equipment used are very old and of obsolete design. The machine shops generally lack the necessary families of machine tools, particularly milling, grinding and boring machines, which are necessary for minimum-quality production. Some of the units had their own foundries, but these also were ill. equipped. It was evident that investment in machine tools and equipment had been completely neglected over long periods.

Some of the older establishments suffer from poor layout, cluttered space around the machines, which make orderly work flow and efficient handling virtually impossible. With one exception, none of the establishments visited practised production planning or production control. Operation workers were generally without instructions on selection of materials, sequence of operations, etc. necessary for efficient production, while the absence of job cards recording the timing of operations precluded any accurate assessment of costs of production. Designs of equipment were invariably obtained from the foreign contractors for the processing plants and followed without adaptation to the local conditions. Faulty design of equipment was evidently at the root of some problems of the user industries. Another constraint is lack of standardisation.

As regards production processes, the mission found one modern foundry in Gresik and a workshop in Bandung making large castings for tea rolling machines which were found to be of good quality, thanks to the technical guidance provided by the Metal Industry Development Centre (MIDC). But the captive foundries in the older metal working establishments were ill equipped, leading to poor quality products with a high rejection rate. There is ample scope, with the help of MIDC and its regional branches for putting to use existing underutilised capacity in the modern foundries, such as that in Gresik. Quality of machining is generally poor, chiefly owing to the age of the machine tools used, although one joint venture enterprise in Medan producing palm oil processing equipment was found to have a good machine shop. By contrast, the quality of welding was generally very high.

Three key constraints evident almost everywhere were the lack of any quality control, leading to poor performance and breakdowns in the user industries; unsystematic management without any systems of production and cost control; and almost complete neglect of equipment maintenance.

These failings of the present Indonesian equipment producing industry should not be taken to imply that domestic equipment production is impracticable or undesirable. But they highlight the need to raise standards of efficiency if domestic equipment production is to be promoted on a larger scale. The most important requirements are the development of a pool of manpower with adequate engineering skills; of design personnel and design standards; of machinists and line personnel, such as foremen; of quality control systems; of more adequate production and financial mangement; and of maintenance procedures, including training of maintenance personnel.

4.4 Edible Oil Processing Equipment

Indonesia has two large edible oil producing industries, coconut oil and palm oil. While coconuts and coconut oil are still largely produced on a subsistence basis and marketed production has been increasingly absorbed by the domestic market, so that Indonesia has changed from an exporter to a net importer, palm oil producion has been expanding rapidly. The main problem of the coconut industry has been aging trees and declining yields, due to decades of neglect of replanting. The Government has embarked on an ambitious rejuvenation programme, including replanting of 35,000 ha and improvement of strains and methods of cultivation. While coconut palms are almost entirely on smallholdings, palm oil is an estate industry. There are some 50 estates, chiefly in North Sumatra. Since harvested fruit must be processed within a specified time, all estates have a primary processing (extraction) facility, and in practice even secondary processing (refining) is usually linked to the plantation. The palm oil sector is open for foreign investment, and some joint ventures have been established. Palm oil production expanded rapidly until 1977, then more slowly for some years. A government decision to divert palm oil sales from export to the domestic market in order to free coconut oil for the export market contributed to a fall in output in 1982. Repelita IV projections envisage large increases in both coconut and palm oil production during 1984-88, by more than 100 per cent in the case of palm oil.

There are three alternative methods of primary processing (extraction) of coconut oil and a somewhat different one for palm oil. For secondary processing (refining), however,although different processes have been used in the past, there is one process (physical refining) which is the same for both. Its obvious advantage for Indonesia is that it reduces the technological variables in the domestic production of refining equipment. A very wide range of equipment, varying from relatively simple tools and structures to technologically quite complex machinery, is required in both the primary and the secondary processing industries for edible oils.

Coconut oil extraction in Indonesia was carried out in 1980 by some 380 enterprises, many very small-scale, with an annual capacity of 850,000 tons but actual production of only 325,000 tons per annum. Assuming 80 per cent normal capacity utilisation, output could be raised to 680,000 tons per annum with existing capacity, equivalent to a copra intake of 1,240,000 tons, well in excess even of the Repelita IV target for 1988. No additional capacity, therefore, appears needed for coconut extraction. By contrast, the expansion of output from newly producing plantations will require a substantial increase in capacity for palm oil extraction. Capacity for edible oil refining in 105 plants was reported to be 282,000 tons per annum, with actual production in 1982 of 254,000 tons which implies a very high (90 per cent) degree of capacity utilisation. Additional capacity for 200,000 tons per annum will be required during 1984-88.

There is a limited production of coconut processing equipment in Indonesia, forty items of equipment valued at Rp. 21 million in 1980. For the palm oil sector, the field mission identified seven equipment producers, five in Medan and two in Surabaya. Only three of these, however, were capable of acting as general contractors, and all three need enhanced engineering capability. The quality of equipment produced by the other four enterprises is poor. Most of the more specialised equipment for palm oil extraction is not as yet produced in Indonesia. No corresponding information was available for coconut oil processing. The equipment for edible oil refining is still wholly imported, except for some civil works and steel structure components.

The annual investment required for new and replacement investment during Repelita IV in edible oil processing equipment (and equipment producing capacity) is estimated at about US $103 million. Some crude oil extraction equipment is already produced locally and domestic production of most of the rest may be expected in due course. The situation is different for refining equipment where lack of engineering capacity presents a major obstacle even for the simpler equipment. It is assumed that by 1985 some 30 per cent of refining equipment should be technically capable of being produced locally and that local content could subsequently be increased by (say) 10 per cent a year. As in the case of the sugar and cement industries, the favoured approach is the establishment of one or more general engineering facilities acting as general contractors. They should be joint ventures in order to draw on the experience and technical knowhow of a leading international edible oil equipment producer. One of its tasks would be to advise on the sequence of technically and economically feasible extension of equipment production.

4.5 Rubber producing equipment

Although synthetic rubbers have become increasingly important, natural rubber still has advantages as a raw material because of its versatility and for special uses (e.g. where heat resistance is important) and the steep rise in the cost of synthetic rubber which followed the oil price increases of the 1970s has improved the competitive position of natural rubber in world markets. Indonesia is second only to Malaysia among rubber producers, with an average share of 25 per cent in world production.

About one-third of Indonesia's output of rubber is produced by estates and two-thirds by smallholders. A programme of extension of area and replanting has succeeded in significantly increasing productive capacity, though it will be some years before the programme becomes fully effective in terms of output. While in the past Indonesian smallholder rubber has tended to be variable and generally low in quality, upgrading, especially in processing, has improved its international marketability.

More than two-thirds of Indonesian rubber output is exported as crumb rubber and about 20 per cent as rubber smoked sheet (RSS) in various quality grades. The value of rubber exports declined sharply in 1981 and 1982 with the world wide recession but some recovery is under way. Small quantities of rubber are imported, mainly synthetic rubber and finished goods. The Repelita IV target for 1988 is 1.5 million tons of rubber. Export prospects are favourable, and domestic absorption is expected to rise to 200,000 by 1988.

Rubber processing proceeds in two stages. The purpose of primary processing is to stabilise and concentrate the natural latex, mostly by centrifugation or creaming. Secondary processing can take several forms. The traditional technology, which yields smoked sheet, involves coagulation of latex, followed by rolling and drying in smoking sheds. In the past decade, the traditional method has been largely superseded by crumb rubber, a product of superior and more homogeneous quality. After cleaning and coagulation, the rubber is crumbed by a machine with rotary blades or a pelletiser. A third process produces crepe rubber, a product of high quality, by repeated shearing and masticating by a rolling machine and simultaneous washing. A new technique, not yet in use in Indonesia but of great promise, is powdered rubber, produced by spray-drying of latex and granulating crumb rubber. It has great advantages in saving of energy and labour in mixing and compounding.

In 1983, there were 151 crumb rubber plants in Indonesia (131 domestic and 20 foreign) with a total rated capacity of 1,045,000 tons per annum, but capacity utilisation was only 56 per cent. How much of the excess capacity was effective is not known. No corresponding data are available on the rest of the rubber processing industry which consists mostly of smallholders and small-scale enterprises. There is considerable rubber manufacture. In 1980 some 166 enterprises, employing 31,000 persons, produced tyres and other finished products, equivalent in terms of value added to 4.8 per cent of all manufacturing.

Most equipment, such as tanks, for the traditional methods of rubber processing is locally made by traditional methods. The main equipment for production of concentrated latex, centrifuges are usually imported (largely from Germany); in view of their technical complexity and declining demand for the product, domestic production is unlikely. Nor is any of the equipment used for crumb rubber production as yet made domestically, although most of the items, such as shredders, washing tanks, conveyors, driers and compactors, are relatively simple. The equipment for the present plants was originally imported from Great Britain. If the data on capacity utilisation are correct, greatly increased output could be obtained without new investment, unless the additional planned production is in areas too remote from the existing processing plants. The Government is reported to be planning to install six new crumb rubber plants, a number too small for economic domestic production. Whether there would be enough replacement demand could be determined only by a survey of the existing 151 enterprises. Demand for the machines needed for creping is also unlikely to be large enough for economic domestic production, though the possibility of production under ASEAN complementation arrangements may be worth examining. The potential importance of powdered rubber is such that a feasibility study of domestic manufacture is desirable.

4.6 Sugar processing equipment

Although sugar production has been growing rapidly, at an average rate of 8 per cent per annum (1976-81), it has not been able to match the growth of domestic consumption, so that sugar has had to be imported in increasing volume. More than half of Indonesia's cane sugar is still produced on (mainly government-owned) estates, but the share of smallholder production has been rising, partly because of a deliberate policy of transforming the sugar industry from an estate to a smallholder structure, and yields on smallholdings have been rising, although they remain much below yields on estates. Indonesia also produces some 350-400,000 tons of brown sugar, largely on a subsistence basis.

Sugar production is expected to grow during Repelita IV at a somewhat slower rate than during Repelita III, but the Government hopes to meet all domestic demand and return Indonesia to a net export position. To meet these targets, a substantial programme for expansion of area under sugar cane establishment of new mills is planned, both on the outer islands.

The great majority of Indonesia's 58 (1983) sugar mills are government owned (51) and all but three are on Java. One, in Lampung, is a foreign investment project. Since the mid-1970 a large factory rehabilitation programme financed by a World Bank loan has been under way. Repelita IV envisages an increase in sugar processing capacity by 800,000 tons by 1988, equivalent to 12 new mills. The Government in fact plans to build 12 new mills, all but two on the outer islands; six are under construction and a seventh has been commissioned. Beyond 1988, two more mills will have to be commissioned every three years to meet projected demand.

The seven mills under construction have been commissioned on the conditions that the international equipment supplier cooperate with a domestic equipment manufacturing company and that a local content of about 60 per cent be achieved. There are at present six local companies (three state-owned an three private) engaged in engineering planning of sugar mills and production of various kinds of equipment. Some have begun to manufacture centrifuges under licence. The next mills to be commissioned are to have an Indonesian company as the main contractor supported by an international sub-contractor; local content is to be raised towards 80 per cent. A wide range of parts is also produced, mainly on the often well equipped repair shops of the mills.

Assuming that local content of the five new mills to be installed by 1988 reaches 70 per cent, US $28 million per year investment in new processing capacity will be required. Adding replacement of outdated equipment and spare parts, and investment in equipment producing capacity, raises total investment requirements for technically feasible local production to US $78 million a year.

4.7 Processing equipment for cocoa, coffee and tea

Indonesia has not hitherto been a significant producer of cocoa. In 1981, some 15,000 tons were produced, mainly on government estates. A programme of replanting and extension of estates is expected to increase output substantially during the 1980s. Most cocoa is exported, chiefly in the form of beans, powder and paste, but there are also imports of beans for quality blending.

By contrast, Indonesia is a major coffee producer, ranking fourth after Brazil, Colombia and the Ivory Coast. Coffee is mainly a smallholder crop. The bulk of Indonesia's coffee is robusta. The world coffee boom of the mid-1970s greatly benefited Indonesia's coffee growers, and coffee exports reached US $656 million in 1980. Prices then declined and the value of exports fell by nearly fifty per cent in 1981, but there has been some recovery since.

Tea is predominantly an estate crop, grown chiefly on higher ground in Java. Most estate tea is processed to black tea for export. Indonesia ranks fourth among tea exporting countries, but tea accounts for only three per cent of non-oil export earnings.

For all three of these estate/smallholder crops, Repelita IV envisages ambitious output targets, in the cases of cocoa and coffee increases by 10,000 tons a year.

Cocoa processing to prepare beans for export involves fermentation, washing, drying and grading; the equipment needed consists of flight conveyors, tray driers and graders. The equipment needed for further processing into paste and cake is more complex and specialised, including grinders, mixers and presses.

Coffee processing involves curing, grading, roasting, blending, grinding and packaging. The chief equipment needed for (wet) processing consists of de-pulpers, pumps, rotary driers, hullers, catadors and vibrating graders; in addition roasters and sieves for roasting, cracking and grinding mills for grinding and some additional equipment for the manufacture of instant coffee.

Processing of tea involves withering, rolling, fermentation, drying and grading. The main items of equipment needed are withering troughs with blowers, rolling machines, sorting machines, driers, graders, packers, heat exchangers and suction winnowers.

The available information on present local equipment production for these processing industries is very inadequate. The simple equipment for cocoa bean processing appears to be mostly made locally. So is some coffee processing equipment, but most of the equipment in use is very old and inefficient, especially driers which at present account for 65 per cent of processing equipment cost. Their inefficiency is largely responsible for the poor quality and low prices that Indonesian coffee commands. Production of tea equipment is carried on in several general workshops, in Bandung and elsewhere.

In view of the similarities among processing equipment for the three crops, especially driers for cocoa and coffee, joint demand could rise to levels sufficient for economic domestic production. Total investment requirements during 1985-88 for the three processing industries are estimated at US $14 million a year of which 80 per cent may be technically capable of local production. In addition, some US $3 million would be needed to enlarge and upgrade equipment production capacity.

4.8 Wood Processing Equipment

More than 60 per cent of Indonesia's land area is covered by tropical forest, but conservation and reafforestion are urgently needed to maintain the country's forestry potential. Official figures indicate 45 million ha of exploitable and another 48 million ha of potentially exploitable forest, but such data need to be treated with caution. They include large areas where exploitation is uneconomic because of high transport costs (e.g. in Irian Jaya) or undesirable for environmental reasons. At present Kalimantan accounts for more than 50 per cent of forest exploitation. The main species cut for export are Meranti (53 per cent) and Ramin (15 per cent).

In 1978, after a decade of very rapid expansion of log exports chiefly to Japan and other east Asian countries for plywood and other processing, the Government of Indonesia decided to enforce increased domestic processing by, in effect, drastically and progressively restricting export of logs by 1985 and promoting plywood production. The result has been an investment boom in saw mills, veneer and plywood manufacturing. In some cases production plants threatened with shutdown in overseas countries formerly dependent on Indonesian logs have relocated in Indonesia. Between 1979 and 1981, production and exports of logs dropped sharply, while plywood exports have begun to expand, partly offsetting the loss of export earnings.

In wood processing, "primary" processing commonly includes all processing which uses logs as inputs, including plywood and fibre board production as well as saw milling, while "secondary" processing is used to refer to manufacture of wood products, such as furniture. While saw milling equipment consists chiefly of the saws themselves, plywood production requires a wide range of partly sophisticated machinery. Wood working machining and assembly equipment can be economically produced in relatively small quantities if labour-intensive processes are employed.

Nominal capacity for saw milling has increased greatly, to 8.1 million m^3 according to official data. But much of this capacity in Kalimantan operates at only 50 cent of capacity because of outdated equipment, and the capacity figures may be inflated by the companies to secure larger export quotas. There is also a large but unknown number of small enterprises using band or hand saws. The present investment cost of a 3-line saw mill of 70,000 m^3 capacity is US$ 28.6 per m^3, a relatively low figure which indicates low operational quality of the machinery, but there is a trend towards improvement of the end product.

There were in 1983 67 plywood factories in operation, with a production capacity of 3.1 million m^3, running at very high (89 per cent) capacity utilisation and exporting 81 per cent of their output. Another 105 investment applications with a total capacity of 3.6 million m^3 were pending. Investment costs in machinery and equipment show a very wide range from US$ 80 to US$ 480 per m^3. Recent technological developments overseas, however, may have important implications for plywood production planning in Indonesia. Medium-density fibre board (MDF) is a superior product with lower costs of production and is rapidly displacing plywood in North America and Europe. An assessment of the desirability of switching from plywood to MDF production in Indonesia, and the consequences for processing equipment production, is urgent.

Furniture and wood working is predominantly a small-sacle industry, with an estimated 4,000 establishments of which at most 10 per cent are mechanised. The industry has grown rapidly in recent years, as is indicated by a remarkable rise in imports of small (workshop type) machinery which have risen from 250-400 pieces a year in 1975 to more than 10,000 pieces in 1982/83.

As regards potential for domestic equipment production in Indonesia, much of the log intake, distribution and transport equipment for saw milling can technically be built in Indonesia, while the saws themselves which are high precision instruments cannot be recommended for local production at this stage. About 30 per cent of the equipment needed for plywood production should be capable of domestic production, and this percentage could rise gradually to 60 per cent. Whether the same would apply to fibre board production remains to be investigated. Driers for which there will be demand also from saw mills and other wood working plants might be domestically produced to the extent of 60 per cent of content, i.e. excluding the extremely difficult control equipment. Of the general purpose machine tools needed for wood working, up to 80 per cent should be technically capable of local production.

Estimates of investment requirements for saw milling and plywood production during Repelita IV reach very high figures - US$ 72-100 million for saw milling and US$ 460 million for plywood. In view of the magnitude of investment requirements and the uncertainty about future demand for plywood, any decisions about domestic production of processing equipment should be preceded by a detailed sub-sectoral study.

4.9 Cement Processing Equipment

Despite very rapid growth in cement production and consumption in the past decade, Indonesia still has by far the lowest per capita consumption among east Asian market economies. While domestic production increased 13-fold to 6.8 million tons in 1981/82, it was outstripped by growth of consumption, so that 0.5 million tons had to be imported in 1982. Installed capacity of 11.7 million in 1983 was divided between 8 companies, chiefly in Java and Sumatra. Capacity utilisation was rather low, around 65-75 per cent. Most domestic production consists of Portland cement, the most widely used kind, with some specialised production, e.g. for oil wells.

Ambitious expansion plans, to raise cement production capacity to 17.9 million tons by 1987 in order to keep up with rising demand and if possible dispense with imports, have had to be scaled down by financial exigencies. Prospective expansion may now tentatively be put at 15 million for 1987 and 21 million for 1993.

Mechanical equipment accounts for about one-third of the total cost of a cement factory (the other two-thirds being construction costs and commissioning and electrical equipment). Total investment costs of a factory of 0.5 million per annum capacity is about US$ 100 million; for a factory of 1.5 million tons capacity US$ 155 million (implying very large economies of scale). Cement factories are highly sophisticated and technologically complex "products". Suppliers carry all technical risks which are subject to severe penalty clauses. It is therefore not easy for a new supplier to match the experience and credentials of the small number of international cement factory producers.

At present, steel ducting, chutes, tanks and bins are fabricated in Indonesia. These represent less than 40 per cent of equipment costs. The best potential for additional local production is for sheet metal products produced by automatic welding, conveyor and transport systems and for some items of electrical equipment, such as switchboards, low and medium voltage switchgears, cables, control panels, and some others. Some quarry equipment could also be supplied locally; also some spare parts, especially refractory bricks and castings.

Total required annual investment in equipment for cement production is estimated at US$ 200 million during Repelita IV. On a long run basis, which would require much further technical and economic analysis, the local share could rise from one-half to two-thirds in the coming decade. The sophisticated technology of cement production makes it difficult to develop domestic production of individual components. As in the case of sugar industry, the best strategy is likely to be to aim at the establishment of integrated engineering facilities through joint ventures, on the understanding that there will be a gradual increase of local production of equipment. In co-operation with the joint venture partners policy guidelines could be drawn up for the increase in local content, including incentives for sub-contracting of part of the equipment to domestic firms and the development of production facilities for heavy equipment and machinery. Some of these items might be included in the planning of a General Machine Shop in Surabaya.

4.10 Equipment for the textile industry

The textile industry in Indonesia is so large and diverse that it cannot be covered in any depth in the framework of the present study. An in-depth study would need to asses market prospects at home and abroad for each of the four main sub-sectors - spinning and synthetic fibre production, weaving/knitting, finishing (dyeing, printing, etc.) and garments production. It would need to examine the relevance to Indonesia of the rapid changes in modern textile technology which are going on in the world and which must have profound effects on appropriate equipment for textile plants in the next decade and beyond. Finally, it would need to concern itself with the present condition and future prospects of the small-scale and handicrafts sector and its equipment requirements. None of this has been possible in the short time available. The following analysis, therefore, is even more tentative than that in the other industry studies. It focuses primarily on two sub-sectors of the modern textile industry, yarn and fabric production; it leaves aside both the finishing industry of the modern sector and the small-scale and handicrafts sector.

Textile production increased spectacularly during Repelita II and III. Yarn production increased almost tenfold between 1973 and 1983, output of fabrics nearly sevenfold. In the spinning sub-sector there are about 70 enterprises with an installed capacity of some 200,000 tons. Synthetic fibre production began in the 1970s and now extends to some polyester (filament and fibre), nylon filament and texturised fibre, with a total capacity of about 400 tons per day. Weaving is by far the largest sub-sector of the modern textile sector. It consists of some 90 large enterprises with an average of 210 (automatic) looms, some 1,500 smaller enterprises using some 75,000 power looms and about 5,000 small and medium enterprises which produce textile fabrics using hand looms. In knitting there are 52 large enterprises, while garment manufacturing has 65 large, over 200 medium-sized and an unknown number of small enterprises. The most important development of the past decade has been the establishment, chiefly through Japanese investment, of large integrated textile mills using fairly sophisticated automatic equipment.

Employment in the textile industry has been growing relatively slowly, at 1.75 per cent per annum, largely because of displacement of labour in the informal small-scale sector. Virtually all the raw materials and many other production inputs into the textile industry are still imported. Domestic raw cotton production amounts to only 6,000 tons a year, while imports rose to nearly 120,000 tons by 1980. Rayon and synthetic fibres are also still predominantly imported, although increasing domestic production has kept imports of synthetic fibres fairly stable at about 25,000 tons a year.

Considerable efforts have been made in the past decade to stimulate textile exports, chiefly garments, and some success was attained during 1979-80. After falling back during the recession years, exports are now recovering somewhat.

Repelita IV aims at an average growth rate of yarn production of 3.4 per cent a year, of 3.8 per cent for fabric and 12.4 per cent for garments. Synthetic requirements are expected to grow at 3.6 per cent. Almost one-half of garments output will, it is hoped, be exported.

There is some production of equipment, spare parts and components for the textile industry, chiefly for small and medium-scale enterprises. Simple looms are made domestically. But their quality is such that little if any of it can be used in the modern sector. Textile machinery for modern plants is imported, mainly from Japan. One reason why domestic production of spare parts and components is difficult to assess is that much of it is sold under foreign brand names to improve marketability. Domestic products have a substantial price advantage over imported ones, but their quality is much inferior.

The rate of technological progress in textile machinery, especially the development of shuttleless weaving and generally automated production in integrated plants, is such that the technological gap between highly industrialised and developing countries is again widening. Modern equipment is so costly and employs so little labour that it is, prima facie, inappropriate for countries with Indonesia's factor proportions; yet output from these modern plants may well be price as well as quality competitive with labour-intensive production from low-wage countries. In these circumstances, one option for Indonesia is to focus specifically on the equipment needs of the small-scale and handicrafts sector, supplying good-quality cheap equipment which may help it survive. A second, not mutually exclusive option is to secure equipment for the weaving industry by importing second-hand power looms from countries now discarding them in favour of more advanced equipment. From a strictly economic point of view, such redeployment may well be the best course in the short or medium run, but it makes little appeal to planners who seek to raise the country's industrial and technological capability in the long run. A third option is to follow in the footsteps of the previous generation of industrialising countries, such as Brazil, by embarking in gradual stages on domestic production of equipment for the modern textile industry.

In Indonesia, this might well begin with assembly of spinning machines including draw frames, followed by assembly and increasingly local production of looms. Scope for local assembly production may be put at (say) 285 spinning machines at US$ 74,000 each i.e. an investment of US$ 21 million a year, plus at a later stage US$ 3 million for draw frames. Investment required in new capacity for assembly and component production is estimated at US$ 15-20 million. Employment creation might be put at 1,000 new jobs.

In view of the uncertainties surrounding the future of weaving industry development, even tentative estimates of potential domestic production of weaving machinery would be inadvisable. A detailed sub-sectoral analysis is needed.

4.11 Recommendations

The estimates of technically feasible local production of equipment for the selected industries add up to the following aggregate totals:

(i) Investment in equipment during Repelita IV for seven processing industries (excluding textiles) approximately US$ 925 million a year.

(ii) Technically feasible local production of processing equipment approximately US$ 470-560 a year.

(iii) Investment required in additional capacity for processing equipment production approximately US$ 330-360 million.

(iv) Direct employment generation in equipment production: 21,000-23,500 jobs.

These are very tentative estimates, subject to many uncertainties which require clarification before any firm judgements can be made. One of the most important facts to be established is the volume of effective excess capacity, both in the processing and in processing equipment producing plants. The amounts of equipment required differs greatly among the various industries considered. Requirements are very much smaller in the cash crop (cocoa, coffee, tea) and probably rubber processing industries than in the others. By far the largest potential is in wood processing. If employment creation is a major criterion, this sector would deserve priority. But very large investment, technology transfer and manpower training would be needed. In terms of employment generation, the edible oil, sugar and cement industries combined come close to wood processing. If Indonesia succeeded in mastering the highly complex technology for assembly and gradual production of textile machinery, employment generation in this sector could also be substantial. But it should once more be underlined that this task will require enormous efforts. In terms of employment, as well as overall economic growth and welfare, the net benefits would be negative if high cost and poor quality equipment imposed additional handicaps on the processing equipment using industries.

Table IV.1 presents a list of items of equipment or equipment produciton facilities which are recommended for further consideration for local manufacture. The list should be regarded as one of "most promising candidates", in the sense that their technical feasibility seems more assured than of other machinery and equipment required by these industries.

While the equipment requirements of each demand sector have their own peculiarities and require specific approaches to the development of corresponding engineering industries, there are some measures of a general character which may be recommended for follow-up action in relation to all of them. These are:

1. Assistance to equipment producers or industries with potential for equipment production, especially in production management, engineering design, quality control and manpower training. The wood processing and wood equipment industry command high priority in this regard.
2. Assistance in the promotion of an "integrated approach" in the establishment of processing plants for sugar, cement, edible oil refining, saw milling, plywood and fibre board, where a joint venture between an international equipment producer and a domestic company acts as general contractor which sub-contracts production of equipment, with gradually increasing local production.
3. Feasibility studies or sub-sectoral analyses to determine the economic, as well as technical, feasibility of domestic equipment production in the areas tentatively recommended.

Table IV.1 Summary of Equipment Production Recommendations

Demand sector	Domestic Equipment Production Recommended as Technically Feasible*
Edible oil	
extraction	Hammer mills
	Screw presses
refining	Integrated approach (IA)[a/]
Rubber	(Powdered rubber equipment, subject to feasibility study)
Sugar	Raising local content from 60 to 70 per cent under IA[a/]
Estate crops	
cocoa	3 types of machinery[b/]
coffee	6 types of machinery[b/]
tea	10 types of machinery[b/]
Textiles	
spinning	Ring spinning machines
	Hank winding machines
	Draw frames
Wood	
Saw milling	Driers
	Installations (up to 50 per cent local content); IA[a/]
Plywood/ fibre board	Raising local content from 30 in stages to 60 per cent, guided by IA[a/]
Wood working	Band saws
	Circular saws
	Planing machines
	Milling machines
Cement	Spare parts
	Castings, especially grinding balls, guided by IA[a/]

* NB All these recommendations are subject to studies of economic feasibility.

a/ IA = Integrated approach; cf. 4.6 in Part V.

b/ CF. section 7.4 in Part V.

4. Promotion of industrial technology transfers through know-how agreements and joint ventures with appropriate foreign partners.
5. Training of manpower, to meet the large new demands that would be made by an extensive programme of capital goods production.
6. Examination of the scope for ASEAN regional complementation arrangements in industries, such as rubber, timber, sugar, palm oil, coconut oil and textiles in which two or more ASEAN countries may be interested in developing domestic production of processing equipment.

UNIDO recommends a technical assistance programme to support Indonesia's efforts in the above areas.

Chapter V. Capital Goods Production in Developing Countries: International Experience

Before turning from the analysis of past performance and future prospects for capital goods production in Indonesia to policy recommendations, it may be useful to glance briefly at international experience of developing countries. This chapter begins with an overview of international trends in trade, production and consumption of capital goods. It then focuses first on Latin American experience and then on two particularly interesting cases: the role of multinationals in Brazil and of technological innovation in the Republic of Korea. The second part of the chapter examines a range of problems that have been encountered by developing countries at the industry and plant level.

5.1 International Trends in Capital Goods

International trade in capital goods is, not surprisingly, dominated by the developed countries. They accounted in 1978 for 88 per cent of exports and 60 per cent of imports. The centrally planned economies had another 10 per cent of balanced trade. The developing countries are overwhelmingly net importers, with 30 per cent of imports but only 2.6 per cent of exports (1978).

Between 1970 and 1978 the developing countries increased their share in trade in engineering products only marginally, but in absolute terms their exports of engineering products increased almost tenfold, to US$ 9.4 billion. As in the case of the developed countries, a relatively small number of developing countries accounted for the bulk of this trade. In 1979, only six developing countries (Singapore, the Republic of Korea, Hong Kong, Brazil, Yugoslavia and Argentina, in that order) recorded exports of machinery and transport equipment in excess of $US 500 million. More than one-half of the exports of the three leading exporting countries fell into class 71 (electrical machinery) and consisted chiefly of electronic products and components, although the Republic of Korea has been developing rapidly as an exporter of other machinery and equipment. More than 50 per cent of these exports went to developed country markets. Brazil and Argentina have become significant exporters of non-electrical machinery and transport equipment, in Brazil's case at a level comparable to those of several OECD countries.

Production of capital goods in developing countries is almost equally concentrated. Seven countries account for almost 90 per cent of the gross output of 46 developing countries. These meet about 60 per cent of their requirements from domestic production and have substantial, though widely varying, export ratios. There is a second group, with domestic procurement ratios above 40 per cent, which comprises some traditional capital goods producers (e.g. Argentina, Colombia, Chile, Egypt) as well as a number of new ones, including two ASEAN countries, the Philippines and Thailand. All the rest, incuding Indonesia, have domestic procurement ratios of less than 25 per cent and little if any exports of engineering products.

By far the largest producers of capital goods among developing countries in terms of number of establishments and employees are the People's Republic of China and India, but Brazil surpasses India in value of gross output, apparent consumption and exports. (No trade figures for China are available). In Brazil, capital goods already account for 29 per cent of exports of manufactures, as compared with only 19 per cent in the Republic of Korea. Brazil had the advantage of a long prior period of engineering industry development for the domestic market, but the Republic of Korea has been rapidly catching up from a starting point of export-oriented development concentrated initially on consumer goods.

5.2 Latin American Experience

In the years after World War II, much of Latin America embarked on a deliberate policy of industrialization based on import substitution, in the belief that manufacturing industry could serve as the dynamic engine of growth, creating employment for rural surplus labour, absorbing modern technology, reducing dependence on world markets for primary products and on imports of manufactures, and thus overcoming chronic balance of payments problems. By the end of the 1950s, the most influential exponent of this strategy, Dr. Raul Prebisch, had come to the conclusion that the strategy was largely failing to achieve the hoped-for objectives. Import dependence was not being reduced, unemployment was not being significantly alleviated, balance of payments problems remained. He concluded that Latin American countries had to seek export markets for manufactures. His first approach was to recommend schemes of regional integration, to expand the horizons of manufacturers from domestic to regional markets, but none of these schemes

(LAFTA, CACM, Andean Pact) proved very successful. In his proposals for UNCTAD I he emphasised the need for developing countries to look to the large and growing markets of the advanced industrial countries and urged the latter to assist through preferential tariff concessions. Some Latin American countries, especially Brazil, have followed this strategy with considerable success. The majority have continued to rely in their industrial development primarily on production for the domestic market. Both the less and the more export-oriented Latin American countries, however, in contrast to the east Asian NICs, have from the beginning put considerable emphasis on engineering industries and domestic production of capital goods.

Growth rates of GDP and industrial production in most Latin American countries have been a good deal lower, especially in the 1970s, than in the east Asian industrializing countries, growth of GDP averaging about 5 per cent and of industrial production about 6 per cent a year. Alongside this overall growth, there have been considerable changes in the structure of Latin American manufacturing industries. The share of non-durable consumer goods in total industrial value added has fallen from two-thirds in 1950 to one-third in 1977, while the share of metal-working industry (ISIC 383) has risen from 11 to 25 per cent. Within the metal-working branch, the largest increases were recorded by electrical machinery (from 1 to 6 per cent) and transport equipment (2 to 9 per cent).

A breakdown by three subregions - Brazil, the Andean Group and Central America - shows the increasing role of engineering products in the course of industrial development. While in Brazil their share had already passed 15 per cent by 1960 it did not reach this figure in the Andean Group countries until 1977 when Central America still registered a share of barely 10 per cent. Among sub-sectors, transport equipment moved ahead of others in Brazil, followed by non-electrical machinery (the sub-sector containing most capital goods). In the other sub-regions, fabricated metal products still recorded the largest share in 1977. These figures reflect the fact that Brazil's dynamic growth in engineering industry has relied heavily on development of its automotive sub-sector. The Andean Group have also sought to develop automotive production beyond mere assembly of passenger cars but as yet with indifferent success. The prospects for any such development in Central America are meagre, since the minimum scale of economic production is far larger than the small domestic market and realistic export prospects combined.

Latin American governments have all given high priority to industrial development of one kind or another and have sought to pursue this objective with a variety of industrial policies, including various forms of promotion, protection and support activities, such as investment in infrastructure, technical education, development finance, and in varying degree in different countries also by more direct intervention by the state acting as entrepreneur or as buyer of industrial products. Direct ownership has been important in steel production (accounting for 60-100 per cent in Argentina, Mexico, Brazil, Chile, Venezuela and Peru) and in petroleum refining and petrochemicals in most of these countries. But governments have generally refrained from competing with the private sector in most other branches of manufacturing, except in instances where governments have taken over weak companies to maintain employment. The role of foreign investment by multinationals has been contentious, but most Latin American countries have seen a need for their participation in industrial development requiring high technology and large investments.

Because of the importance of the role of multinationals and technological innovation in engineering development, it is instructive to look at two case studies, the role of multinationals in Brazil and promotion of technological innovation in the Republic of Korea.

5.3 Two Case Studies

Transnational companies in Brazil have a production share of 46 per cent in capital goods and 56 per cent in durable consumer goods. Both figures are far higher than for the other two major branches of engineering industry, intermediate products (35 per cent) and non-durable consumer goods (16 per cent). The difference is largely explained by the advantage which multinationals enjoy in advanced technology and access to export markets. Both of these are of greater importance in automotive and capital goods production than in the other two branches of manufacturing if allowance is made for the major role of state enterprise in steel and petrochemical production. The transport equipment sector, and to a less extent electrical and telecommunications equipment production, show larger investment per (multinational) company than the other sectors.

Korean production of capital goods began with shipbuilding, motor vehicle, general machinery and electronics industries in the 1960s. During the 1970s, further policies were adopted to expand machinery production, including schemes to promote heavy electrical machinery, machine tool and textile and agricultural machinery industry, and designation of 85 kinds of key machinery and 35 types of specialized machines for early development. An institute for applied research and quality control was established to upgrade the technological capability of Korean machinery industries. Between 1960 and 1975, the share of the machinery industry in total manufacturing output doubled, with an annual growth rate of 21 per cent, a growth performance due in considerable degree to the incentives provided by government to create a technology base for the industry.

In 1979 a new scheme to facilitate the development of industrial technology for capital goods production was adopted. Its central feature was the designation of certain capital goods as "Newly Developed Innovative Machines" (NDIM) and the offer of special incentives for their production and purchase. Among other requirements for NDIM status were that the product was developed with local patents, without technical co-operation from abroad, with at least 60 per cent of local components (and no foreign components for critical functions) and that no NDIM was an exact copy of a foreign product. Quality of NDIM had to be certified by an independent quality inspection laboratory.

A sample study of innovative entrepreneurs under the scheme has shown that 85 per cent of them were small and medium-sized companies, confirming similar findings in other industrializing countries which suggest that small companies tend to respond more flexibly to opportunities for innovation. Approximately two-thirds of the technological innovations arose in response to market needs, rather than mere technological feasibility. In more than half the cases, the innovative company received outside technical assistance from research institutions or potential users of the product.

5.4 Experience at the Micro Level

Developing countries embark on the production of capital goods for a variety of reasons: to ensure a steady and reliable supply of this key type of input, to take advantage of potential comparative advantage based on low costs of skilled labour, to secure the benefits of spin-off from the capital goods branch to raise the level of technology of the entire manufacturing sector, and to develop a capacity to produce machines embodying specifications and designs appropriate to their countries' factor proportions. Indonesia is now embarking on such a strategy. For a programme of this kind to achieve the intended benefits, it is essential to ensure cost efficiency in domestic capital goods producton. The experience of a selected group of NICs (Argentina, Brazil, India, the Republic of Korea, Mexico, Pakistan and the Province of Taiwan) and of the problems they have encountered in capital goods industries (defined here as comprising industrial and agricultural machinery but excluding vehicles and electrical equipment) may offer valuable guidance.

While skilled operatives in developing countries receive relatively low wages, this ensures a competitive advantage only if the wage differential is not nullified by proportionately lower labour productivity. Two aspects of labour productivity need to be distinguished: "task" productivity (the number of items produced per minute by a worker on a set task) and "plant" productivity (output per operating day which depends on plant features beyond the operative's control). Most observations of factories in NICs indicate that "task" productivity is quite high, despite the use of less sophisticated machinery. In many activities, performance equals that of workers in developed countries, and it is rarely less than 30 per cent of their level. "Plant" productivity, however, is often much lower. In India, for example, labour productivity in the best firmss in the textile-machinery sector was estimated at one-third of that in European countries, in the worst at one-tenth. Similarly, a study in the Republic of Korea found average labour productivity in the entire mechanical engineering sector to be 20-30 per cent of that in Britain and the USA, although wages were still lower (by 90 per cent or more) than in these countries.

Lower productivity at the task level in LDCs, when it was observed, was attributed chiefly to inadequate instruction about the best use of a machine tool, clogged floor space, poor quality tools, inadequate technical aids and failure to use jigs and fixtures in setting-up operations. Low plant productivity is chiefly a function of plant layout and scheduling. The typical plant in Mexico, Brazil and India exhibited poor layout in which the movement of the work-in-process interfered with operations at work stations.

Poor scheduling, observed in a study of forging in India, resulting in reduced use of labour and equipment, delays in identifying and correcting errors and in high interest charges on semi-finished inventory carrying costs.

Low capacity utilization is another characteristic feature of machinery production in LDCs. Mechanical engineering plants usually employ some costly items, such as machine tools, fixtures and welding equipment. Each can be fully utilized only if a plant produces a large batch of items of a single type or a range of products requiring a similar operation such as stamping. At low volumes of output, low utilization rates are unavoidable. Addition of export markets to a small domestic market is one way of reducing this problem.

Materials management is another problem area. Studies in India and elsewhere have observed floor space cluttered with accumulated sand from castings, and fabrication and assembly operations crowded in any place that happens to have room available. The almost universal characteristic is congestion and a mixing of operations which frequently leads to poor quality production.

Sub-contracting has proved an important way of reducing costs in machinery producing sectors. Small firms concentrating on a few operations or components are able to use special purpose equipment fully and to benefit from learning by doing in a specialized area. Two conditions need to be met to reap the potential benefits of sub-contracting. The mother firm must be able to co-ordinate multiple sources of supply so that production is not interrupted by bottlenecks, and the sub-contractors must be efficient and reliable. In contrast to Japan, where sub-contracting played a very major role in the process of industrialization, sub-contracting is exceptional in east Asia and Latin American NICs. The organization costs of sub-contracting, it seems, tend to outweigh the cost reductions that can be derived from it. Related to sub-contracting is failure to make use of opportunities for rebuilding of equipment. The cost of rebuilding is often much below that of new machines, and rebuilding makes it possible to incorporate newly available features. While rebuilding is common in developed countries, it seems non-existent in the Republic of Korea, the Province of Taiwan or the Philippines.

Efficient machinery production presupposes well developed casting and forging facilities, activities which are intensive in skilled labour and do not justify the cost of mechanization except at very high volumes. Foundry and forging operations in developing countries are typically very much less capital-intensive than in developed countries. In India, the capital-labour ratio has been found to be $US 3,500 per worker, as compared with $US 25,000 in developed countries, but the savings in fixed costs are not reflected in greater competitiveness. The price of Indian forgings of comparable quality is on average 50 per cent above the cif price of imported ones. The explanation is partly factors external to the firm, such as high cost and erratic supply of materials, and partly internal inefficiency and small production runs. Similar difficulties have been encountered in the Republic of Korea, such as wastage of material in unnecessarily heavy forging blanks.

Superimposed on the technical difficulties faced by an infant capital goods sector, such as those surveyed in the preceding paragraphs, may be additional difficulties caused by misguided policies designed to foster the sector's development. In the Republic of Korea, Mexico and India, for example, early emphasis on encouragement of large-scale firms through low-interest loans and tax incentives resulted in the purchase of equipment several times too large for the domestic market. Emphasis on size often leads to laxity about quality. High quality is particularly important for machine tools. If locally produced machine tools are not adequate for high precision work, they can compromise the competitiveness of the equipment producing sector.

As developed countries have lost competitive advantage in the production of simple standard machines and have been obliged to concentrate on higher technology production, a potential export market for simple machines has opened up for developing countries, both in developed and in other developing countries. Developed countries import primarily conventional lathes, drilling and grinding machines demand for which tends to be highly price elastic. The unit price of machines imported by Japan from developing countries, for example, is less than one-tenth that of machines imported from developed countries, which suggests a developing country advantage in the cheaper type of machine and/or in price of any given type of machine.

Given the relative abundance of labour in LDCs, one would expect them to produce machines designed for relatively labour-intensive processes. What little evidence is available does not support this presumption. One reason may be that the evidence is restricted to large firms which often produce under licence and behind protective tariff walls and therefore have little incentive to adapt factor proportions to prevailing relative factor prices. Small producers are more likely to face competitive factor and product markets and therefore feel obliged to adapt imported designs or produce their own, copying and adapting existing equipment.

Relying solely on equipment of older vintage is liable to leave LDCs with a technological disadvantage. Design research then becomes an important additional influence on competitiveness in the longer run. There is evidence of efforts by companies in NICs to modify and upgrade imported designs to produce a machine that permits a lower capital-labour ratio in the using sector. An example is that of Argentine companies manufacturing food-processing equipment that is less mechanised than developed-country equipment designed for the same product. But the general weight of the evidence is that LDCs do not devote enough effort and resources to research, and this applies even to the NICs. Much of the limited research undertaken in LDCs is process related and pertains primarily to design. Technology development is an infant industry that requires intensive, though temporary, nurturing.

Chapter VI. Objectives, Constraints and Policies

6.1 Objectives and Constraints

A number of considerations have led Indonesian policy makers to give serious consideration to the desirability of greater emphasis on manufacturing in general and capital goods production in particular. The likelihood that the oil sector will not continue to propel economic growth to the extent that it has done in the 1970s, both because of less favourable world prices and diminishing exportable surpluses, poses the need for an alternative engine of growth, and manufacturing is the most likely candidate, judging by all past development experience. In Indonesia, industrial development has lagged behind, partly because of the very abundance of oil and other natural resources; and such industrial development as has occurred has been largely confined to production of non-durable consumer goods and more recently durable consumer goods and intermediate products, with little if any production of capital goods. Almost all this development, moreover, has been for the domestic market with relatively high rates of effective protection, with little if any export. As a result, it has not been required to become internationally competitive.

A move into capital goods production is sometimes advocated on the ground that it will fill a "gap" in Indonesia's industrial structure and will achieve a more "balanced" industrial sector. But there is no intrinsic merit in gap-filling or balance. It is true that the development of complementary industries may have favourable "linkage" effects -, external economies which may help reduce costs in other industries or impart a stimulus to other new developments. But it is unrealistic to imagine that a country even as large as Indonesia can aim at a completely self-contained industrial structure, without "gaps". Even the most highly industrialised countries, while most of them produce many capital goods, rely on imports from one another for the great majority.

There is now a prima facie case for the development of a capital goods sector in Indonesia. Over the next two decades, such development could mean a major structural change in Indonesia's industrial economy. But unless capital goods can be produced efficiently, that is to say at or near internationally competitive prices and quality, the domestic user industries will be adversely affected. The net effect on economic growth and employment may be negative.

The best way to ensure international competitiveness is to select industries in which Indonesia is likely to have a comparative advantage, so that no very high rates of effective protection will be needed even in the early stages and some exports may be possible quite soon. It implies a shift from a generally inward-looking towards a more outward-looking industrial development strategy. In the past, Indonesia, like most developing countries in the early stage of industrialisation, has leant towards the former strategy which emphasises replacement of imports in a protected domestic market. It has increasingly come to be recognised that such a strategy is liable to run out of steam as the phase of easy import subtitution draws to a close and to perpetuate dependence on protection by insulating manufacturers from the dynamic stimulus of international competition.

There is a presumption that Indonesia is most likely to have a comparative advantage in resource-based industries and, because of her relative abundance of cheap labour, in relatively labour-intensive industries (and methods of production). A preference for resource-based industries is also likely to promote the objective of better regional balance in industrial development. An emphasis on labour-intensive industries (including, wherever possible, assistance to and involvement of small-scale enterprise) will promote the objective of employment creation (hence more equitable distribution of income) and international competitiveness. All these considerations have led Indonesian economic planners to focus on industries producing processing equipment for agricultural and forestry products.

Formidable obstacles stand in the way. This is not the place to spell out in any detail the constraints that have hampered Indonesian industrial development and the development of a capital goods or engineering sector in particular. Dutch colonial policies and subsequent decades of political instability hampered manufacturing development until Repelita I. What there was of it, as has been mentioned, was, as in most developing countries in the earliest stage of industrialisation, inward-looking import substitution, chiefly of finished consumer goods. Inadequacies of industrial, business and engineering infrastructure, of skilled manpower, of a technological/scientific base and of experienced management were, and remain, serious constraints, especially in areas such as most capital goods production where more advanced technology matters. A highly regulatory environment inherited from the first two decades after independence, and the increased comparative disadvantage imposed on the whole manufacturing sector by the oil boom of the 1970s further inhibited dynamic entrepreneurial initiatives, although the existing manufacturing industries, producing under cover of high rates of effective protection for a booming home market, experienced rapid growth. If, for the reasons that have been mentioned, selective development of capital goods production is desirable for the 1980s, energetic efforts to remove some of these constraints are an essential prerequisite. Some of the required policies are briefly indicated in the remaining pages of this Main Report.

6.2 Policies

All industrial development presupposes a favourable macroeconomic policy environment - reasonable stability of prices, reasonably stable growth of aggregate demand, reasonable security from violent external shocks.

Specific policies for industrial development can be divided into primarily long-term and primarily medium-term.

Long-term (20-25 years) policies must seek to improve the preconditions i.e. to remedy the constraints mentioned above. Apart from the various kinds of physical and business infrastructure relevant to industrial development, the most important is technical/scientific capability. While in the short- and medium-term, the only way of filling the gaps is reliance on foreign technical assistance in one form or another, the longer-term answer is in technical and scientific education and research. Among the many obstacles in Indonesia are a tendency among middle-class parents and children to look to a humanities or social science rather than a scientific/technological training; and a promotion system which provides virtually no incentives to academics to undertake good academic research.

Medium-term policies, say, for Repelita IV and V, must focus on furtherance of a desirable pattern of industrial development. This means policies to upgrade the efficiency of existing industries and to encourage the development of new industries likely to meet the objectives, i.e. conform to the desired trade-offs among objectives, of national policy. Such policies can be classified in two categories, planning decisions (i.e. measures aiming at a particular allocation of resources determined by administrative decision) and market incentive measures (i.e. measures designed to promote the efficient operation of market forces in guiding investment and other resource allocation decision). While industrial policy making will in practice always employ a combination of both, there are reasons for thinking that an emphasis on the latter approach may be more conducive to economic efficiency and thus international competitiveness.

It is now widely recognised that Indonesian manufacturing industry has suffered from excessive regulation by government. Traditional attitudes and reaction against laissez faire liberalism have combined to impose on industrial development a straitjacket of bureaucratic regulation which has made efficient, flexible and dynamic enterprise extremely difficult. A belief that pribumi businessmen cannot compete with non-pribumi - a belief no longer necessarily justified - has reinforced these tendencies. Taking risks in deregulation may be the single most effective contribution that government can make to industrial development.

This is in no way inconsistent with a policy of giving public enterprises and government procurement an important role in supporting the development of efficient domestic capital goods production. Preference in domestic procurement may be merely a disguised form of protection for uncompetitive firms. But it can also help overcome ingrained prejudice in favour of established brand names of multinational corporations whose products may not necessarily be optimal for Indonesian conditions.

Turning from such general considerations of industrial policy to measures particularly relevant to the promotion of capital goods industries, and more particularly, industries producing processing equipment, there are a number of policies which may be helpful in promoting efficient development of whatever industries have been selected by the criteria indicated above:

a. Sub-contracting. There is a good deal of evidence that production of components and parts by small firms acting as sub-contractors would not only be desirable as a form of assistance to small-scale enterprise but could actually increase efficiency through specialisation and because of the greater capacity of small firms to adapt and adjust. Measures should be devised to remove some of the obstacles which have largely prevented the practice of sub-contracting in Indonesia.

b. Standardisation of Components. Quite a number of types of equipment (or components) are used by more than one processing industry, e.g. presses, driers, pumps, etc. So long as each industry uses equipment or components with different specifications, the volume of demand for each may be inadequate for economic domestic production. Where standardisation is possible without adverse effects on the user inutry, it could be helpful in achieving an adequate volume of demand.

c. Quality Control. Poor quality control has been identified as one of the most serious weaknesses of almost all enterprises at present engaged in processing equipment production in Indonesia. At the same time, some outstanding exceptions of good quality production under the guidance of the Bandung Metal Indutry Development Centre came to the notice of the UNIDO field mission. The example of the Republic of Korea where the establishment of an Institute for Machinery and Metals made a major contribution to upgrading technical capability and an independent quality inspection laboratory under the "Newly Developed Innovative Machines" incentive scheme to the maintenance of high quality (see Part VI, section 2.2 below) may have valuable lessons for Indonesia.

d. Research and Development. There are several institutions in Indonesia, besides the MIDC in Bandung, with a potential role in raising the technological capability of industry by the promotion of research and development (R & D). Among them are the Institute of Technology (ITB) in Bandung, the Material Testing Institute (MTI) in Bandung and the Centre for Development Research, Science and Technology (PUSPIPTEK) at Serpong near Jakarta. Besides these scientific and technical institutions, there is the Agency for the Assessment and Application of Technology (BPPT), created in 1979 and reorganised in 1982, with the task of advising government agencies and the private sector on technology development. Its chairman is the Minister of State for Research and Technology and among its 22 directorates are several with relevance to capital goods, such as the directorates for machine and electrotechnical industries, for processing and engineering industries, for defence and strategic industries and for industrial infrastructure. In addition, among its technical operation units, there is a Processing Technology Unit.

Clearly, the institutional framework for R & D is expanding, but the institutes need to change their present relatively passive attitude towards industrial enterprises and play a more active part in stimulating technological development for the manufacturing sector. The UNIDO field mission observed that most enterprises were unaware of the possible R & D and operational support which could be obtained from these institutions. There is need for more promotional efforts on their part and more active co-operation with industry associations and individual enterprises.

e. Industry Associations. In Indonesia, industry associations function at present mainly as lobbying and public relations agencies. They could develop an important role in promoting the managerial and technological capability of their member companies. Their management needs to be entrusted to carefully selected professionals with managerial, financial/accounting and engineering experience. Thus qualified, the associations should extend their work to managerial and technical issues, market analysis, trends in technology (especially overseas), training and education requirements (especially apprenticeship), promotion of sub-contracting, co-operation among members and with enterprises in other sectors, support of R & D activities, promotion of standardisation, co-operation with government in such matters as local content programmes and the formulation of policies and common positions in areas such as investment regulation, credit policy, taxation, foreign trade, environmental control, deregulation and infrastructure. Such an active role of industry associations would be beneficial both to their member enterprises and to the development of their industries in the national interest.

f. Education and Training. Skilled labour, experienced and competent technical staff and (in less degree) commercial middle mangement are scarce in Indonesia. To overcome these deficiencies in the short term it will be necessary to rely, besides technical assistance from abroad, primarily on on-the-job training, workshops and short courses, especially for domestic enterprises without foreign partners. Wherever practicable, overseas technical and management training facilities, combined with practical experience in overseas plants, should be made available to Indonesian trainees. Besides these short-term measures, it goes without saying that there is continuing need in the longer term to extend and upgrade basic and academic technical education in science and engineering.

g. <u>Exports</u>. It may be that, for certain types of processing equipment for which there is a substantial domestic demand and which is relatively simple in design, Indonesia could secure export markets in neighbouring (and perhaps other) countries with the same raw material producing and processing industries. Exploration of such export opportunities at the selection stage, and in feasibility studies, and active assistance and training in export marketing once the industry goes into production, may significantly improve prospects. As has been suggested earlier in this report, ASEAN industrial complementation arrangements may provide the ideal framework for such initiatives on a reciprocal basis.

h. <u>Technical Assistance</u>. If, as has been suggested above, Indonesian capital goods industry development must, in the short and medium run, rely heavily on technical assistance from abroad, efforts should be made from the start to involve domestic enterprises and local staff to secure maximum transfer of knowhow. The integrated approach which has already been adopted in the sugar industry and which has been recommended in Part V for several other industries may often be suitable for this purpose. More generally, the involvement can take the form of employment of local staff in increasingly responsible positions in direct investment or management contract arrangements with multinational enterprises or as members of foreign consultancy or technical assistance teams.

There are a number of ways in which UNIDO may be able to contribute to such technical assistance and help Indonesia in the design and execution of the policy measures which have been recommended. More specifically:

a. UNIDO may be able to assist with the technical assistance programme for the development of an integrated approach to equipment processing for certain industries recommended in Part V.

b. UNIDO could advise and assist the programme for technology transfer, management and the building up of engineering capability for processing equipment production recommended in Part V.

c. For most types of processing equipment, studies of economic, and in some cases also technical, feasibility have been recommended before any firm decisions are taken. UNIDO could assist in the preparation of such feasibility studies and sub-sector analyses.

d. A review of overall progress and prospects of the Indonesian industrial sector and analyses of selected priority issues of industrial policy and strategy, including the area of processing equipment production may be desirable halfway during Repelita IV, say in 1987, with a view to providing a sound analytical basis for Repelita V. UNIDO may be able to undertake such a review.

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INDONESIA INDUSTRY SECTOR STUDY*

Part II. Industrial Developments in Indonesia - Past Trends and Future Prospects

Prepared by the

Regional and Country Studies Branch
Division for Industrial Studies

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The UNIDO INDONESIA INDUSTRY SECTOR STUDY comprises the following six parts:

Part I	Main Report
Part II	Industrial Development in Indonesia - Past Trends and Future Prospects
Part III	Survey of Capital Goods and Engineering Industries
Part IV	Long-Term Projections of Demand for Capital Goods in Indonesia
Part V	Potential for Development of a Selective Capital Goods Industry
Part VI	Capital Goods Production in Developing Countries: International Experience

THIS DOCUMENT CONTAINS PART II.

Part II: Industrial Developments in Indonesia - Trends and Future Prospects

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Chapter I. Recent economic development in Indonesia

The decade and a half since 1968 have been a period of rapid and sustained economic development in Indonesia such as few would have thought likely or possible in the 1950s or early 1960s.

Indonesia, the fifth largest country in the world, had passed through several decades of economic malaise and political turmoil. The troubles began with the great depression of the 1930s which severely hit the Dutch-ruled colonial economy. Then followed the scorched-earth policy and Japanese occupation during World War II, the post-war years of war against the Dutch and, after attainment of independence, years of political instability and, despite intermittent efforts by successive governments, economic stagnation or decline. They ended, in the last years of Sukarno's "guided democracy", in economic chaos with few parallels in a large country except in the aftermath of war or revolution. Inflation, fuelled by mounting budget deficits, reached an annual rate in excess of 1,000 per cent. The tax system had largely broken down, eroded by inflation and corruption. For some years no government budget had been published. Exports, throttled by a complex network of multiple exchange rates and regulations, were paying for barely one-half of imports. The country was in default on external debts the magnitude of which was unknown. The infrastructure of railways, ports, inter-island shipping and public utilities, including much indispensable irrigation, had been allowed to run down for decades. The small manufacturing sector, chiefly textile weaving, was operating at 10-30 per cent of capacity for lack of foreign exchange for materials and spare parts. Peasant agriculture had increasingly withdrawn from the cash economy into subsistence production.

The new Government under General Soeharto which took over power during 1966, in the wake of an abortive coup on 30 September 1965, made economic stabilisation, rehabilitation and development its top priorities. Within two years, inflation was brought under control by orthodox monetary-fiscal restraint, assisted by balance of payments support from a consortium of creditor/donor countries (IGGI). Exchange controls were dismantled, the exchange rate gradually unified, foreign trade partially deregulated and efforts made to correct the worst distortions in the domestic price structure. A Foreign Investment Law was passed to provide tax and other incentives to foreign investors. Professional economists, largely from the University of Indonesia, were enlisted, first as economic advisers, later as Ministers, to take charge of economic policy formulation, with a good deal of help from the International Monetary Fund, the World Bank, the United Nations and other agencies. In 1968, development expenditure, which had been temporarily suspended, was resumed for rehabilitation of infrastructure. On 1 April 1969, the first Five Year Plan (Repelita I) came into operation, with food production as the top priority.

Indonesia was fortunate in two respects. The Government's decision to give the highest priority to food, and especially rice, coincided with the "green revolution" in rice - development at the International Rice Research Institute of high-yielding, fast-maturing varieties; and the OPEC oil price increases of 1973-74 and 1979-80 for a decade freed Indonesia from balance of payments constraints and provided ample government revenues. Neither by itself would have ensured successful development. But combined with dynamic but by and large prudent economic policies which grasped the opportunities, the two pieces of good fortune helped lift Indonesia into the category of fast-growing, middle-income countries of East Asia.

Even before the new rice varieties became available, a rice intensification programme (Bimas or "mass guidance") had been initiated in the late 1960s, including irrigation, fertiliser, pesticides, rural credit and agricultural extension. These measures, together with price incentives to farmers, massive expansion of domestic urea production and extension of multiple cropping, laid the foundation for a sustained expansion of rice production, only briefly interrupted by disease and credit repayment problems in the years 1975-77. Growth of rice output averaged 5 per cent a year over 13 years, 1968-81, an achievement probably unmatched in any large developing country. Its importance for Indonesia's economic development can hardly be overestimated. A more than twofold increase in output of the preferred staple food not only directly raised the living standards of the majority of subsistence farmers but increased cash income and purchasing power throughout the rural areas, especially in Java. It expanded non-agricultural employment opportunities, greatly enlarged the mass market for consumer goods and services and saved foreign exchange for rice imports. In 1982 and 1983, severe drought almost halted growth of rice output, but there are grounds for confidence that the growth trend which has brought Indonesia close to self-sufficiency in rice will be resumed with more normal seasons and that the new technology for higher yields can be extended to other food crops.

Indonesia has been an oil producer for almost a century. The discovery of the large Caltex "Minas" field during the 1950s gave a spurt to crude oil production, raising Indonesia's output to about 2 per cent of world production. In the early 1960s, new agreements between the government and the foreign oil companies gave the state oil enterprise substantial control over the industry and the government a large share in its profits in the form of oil company tax. From 1968 onwards, exploration activity revived, under production-sharing contracts between Pertamina and numerous foreign companies, and output rose rapidly.

It was at this point, in 1973/74, that the fourfold increase in the oil price by OPEC, of which Indonesia was and remains a member, transformed Indonesia's financial situation. The huge improvement in the terms of trade doubled Indonesia's export earnings and, together with renegotiation of the profit split between government and companies, more than doubled government revenue.

The oil boom was a shock to the system and, as in other oil exporting countries, brought difficulties of economic management. Large domestic deficits, which were consistent with formally balanced budgets while export revenues were rising rapidly, threatened hard-won price stability. In 1974 the inflation rate rose again to nearly 40 per cent. Over-exuberant expansion of the state oil enterprise, Pertamina, caused a major crisis which temporarily shook confidence in the Government's credit. The mid-1970s brought symptoms of the "Dutch disease", as non-oil traded goods producers, in cash crop export and import-competing manufacturing industries, were squeezed between a fixed exchange rate and domestic inflation. It was primarily this concern that led to the large devaluation of the rupiah (by 33 per cent) in November 1978, although balance of payments considerations - declining real prices of crude oil and a slump in world market prices of some of Indonesia's major non-oil export commodities - also seemed to justify such a step. In the event, the second OPEC oil price increase, of 1979-80, on the contrary, brought three more years of large balance of payments surpluses and abundance of government revenue. Inflation again threatened to get out of hand but was again well contained.

All these vicissitudes notwithstanding, there is no doubt that the two oil booms brought immense benefits. They made possible economic and social development programmes on a scale that would have been inconceivable without them. Whereas the first Five Year Plan, with its relatively modest overall targets, had focused on economic recovery and growth, largely neglecting social objectives for the time being, and within economic development on food production, the much more ambitious second and third Five Year Plans deliberately shifted the emphasis significantly towards social welfare, and within economic development towards industry, especially resource-based manufacturing.

Much of the additional oil revenue was used for so-called Inpres (Presidential Instruction) programmes for work creation on local public works, for school building, health clinics, drinking water, family planning and reafforestation projects. At the same time, the country's hydrocarbon, mineral and timber resources became the basis for very large, capital-intensive projects for the construction of oil refineries and other petrochemical plants, LNG trains, fertiliser and cement factories, aluminium and other smelters, saw-milling and plywood capacity, paper and sugar mills - mostly state enterprises or joint ventures with foreign investors. IGGI project aid and official commercial borrowing overseas supplemented oil revenue to finance a great deal of investment in irrigation, road construction, urban renewal and other infrastructure, as well as the Bimas and transmigration programmes. Partly as an easy way of distributing more widely the benefits of the oil bonanza, large budget subsidies kept down the prices of food, fertiliser and oil products.

Table I.1 presents some indicators of overall economic performance during the years 1968-81. Economic growth, measured by GDP at 1973 prices, averaged 8 per cent a year. The inflation rate fluctuated with the two oil booms after the initial stabilisation phase but was notably brought back to single digit figures in 1978 and again in 1981 (and 1982). The investment ratio (gross fixed capital formation as percent of GDP) rose from 9 to 21 per cent, the tax ratio (government revenue, including oil tax, as percent of GDP) from 8 to 24 per cent. Rice production rose at an average annual rate of 5 per cent, total food production at 4 per cent and the contribution of the broad agricultural sector (including forestry and fisheries) to GDP at 3.5 per cent. Production of crude oil peaked in 1977 and has since then hovered around a slightly lower figure, as the yield of the Minas field has declined and exports have been restrained by demand as well as the OPEC quota. Much of the growth of modern sector industrial production has been relatively capital-intensive, its direct contribution to employment has been small, estimated at almost half a million during the 1970s.

Table I.1 Indicators of economic performance, Indonesia, 1968-81
(Percentage)

Year	GDP Growth Rate	Inflation Rate	Growth of Output				Investment	Tax
			Rice	Food	Agriculture	Crude Oil	GDP Ratio	GDP Ratio
1968	13.9	85	12.5	9.1	6.9	18.0	9	8
1969	9.0	10	5.1	1.0	1.1	23.3	12	9
1970	10.9	9	6.5	3.5	4.2	15.1	14	10
1971	6.5	2	4.7	3.4	4.0	4.3	15	11
1972	9.4	26	-3.6	1.1	2.1	21.3	19	13
1973	6.8	27	10.6	7.0	5.5	23.8	18	15
1974	7.6	33	4.7	6.9	3.7	2.8	17	16
1975	5.0	20	-0.6	0.9	0.0	-5.0	20	18
1976	6.9	14	3.9	3.5	4.7	15.3	21	19
1977	8.8	11	0.1	-1.2	1.6	11.7	20	19
1978	6.8	8	10.1	9.6	7.2	-2.9	21	19
1979	5.3	20	2.3	4.0	3.8	-2.6	21	21
1980	9.6	16	12.8	8.6	5.2	-1.1	22	24
1981	7.6	7	10.4	8.1	3.5	1.6	21	24
Annual Average 1968-81	8.2	20.1	5.1	4.0	3.4	7.8		

Source: Central Statistical Bureau.

Evidence on the distribution of income is still inadequate for firm conclusions. Inequality in urban areas, and between urban and rural areas, has almost certainly increased, chiefly because of the concentration of modern sector growth in Jakarta. But inequality within rural areas, and between Java and the outer islands, appears to have diminished. There is no doubt that the great majority, even in the bottom 40 per cent of the income distribution, have experienced an improvement in material living standards. GDP per head, according to World Bank data, in 1980 passed the $400 mark which the Bank used to divide middle from low income countries. But this figure is deceptive. Indonesia is still a poor country, with a large proportion of the people living in poverty. Per capita household expenditure in rural Java, which contains half the population, is still within the range of $120-150. The average holding of those who own land in Java is only 0.5 ha, and estimates of landless (i.e. owning no cultivable land) range from one-quarter to one-third of the rural population.

In a country where only those who can rely on family support can afford to be unemployed, figures for open unemployment do not mean much. But a large proportion of the Indonesian labour force consists of "working poor", forced to work long hours for low wages or to scratch a living in intermittent low-income activity. With a work force growing, and expected to continue to grow, at about 2.5 per cent a year, the task of generating opportunities of productive employment for more than 2 million new entrants to the work force each year, as well as for the underemployed in the present work force, constitutes the most pressing longer-term problem for Indonesia's economic policy makers.

In the past two years, adverse trends in the world economy - prolonged recession in the OECD countries and the turnaround in the world oil market - have seriously worsened Indonesia's short- and medium-term economic prospects. For some time, there had been concern about Indonesia's capacity to maintain the volume of oil exports because growth of domestic consumption of oil products, such as kerosene and gasoline, at heavily subsidised prices, was eating rapidly into exportable surpluses. World Bank projections published in May 1981, which assumed that the real world price of oil would continue to rise at 3 per cent per annum through the 1980s, indicated a recurrence of balance of payments deficits in the latter half of the decade, unless policy measures were taken to restrain domestic consumption of oil products as well as imports and to stimulate non-oil exports. The ink on these projections was hardly dry when oil prices began to fall under the impact of a world glut caused by delayed response of supply and demand to the sixfold increase in price since 1973 and aggravated by the recession. As the official OPEC price fell from $34 per barrel in 1981 to at most $29 per barrel in 1983, Indonesia's current account balance moved from a surplus of over $2 billion in 1980-81 to a deficit of nearly $3 billion in 1981-82 and nearly $7 billion in 1982-83 (Table I.2). Declining oil export earnings also threatened a sharp cut in net oil tax revenue.

Table I.2: Balance of payments, 1974/75, 1979/80-1983/84 ($ million)

	1974/75	1979/80	1980/81	1981/82	1982/83 est.[a]	1983/84 proj.
Exports	6,581	18,510	22,885	22,994	19,385	17,483
Oil and LNG (Gross)	4,548	12,340	17,297	18,824	15,630	13,182
Non-oil	2,033	6,171	5,587	4,170	3,754	4,301
Imports	-6,514	-13,205	-17,589	-22,635	-22,681	-20,502
Oil sector	-1,910	-2,940	-4,050	-5,407	-5,468	4,551
Non-oil imports	-4,341	-9,028	-11,837	-14,561	14,803	-13,986
Non-factor services (net)	-263	-1,237	1,702	-2,667	02,411	-1,965
Factor Services	-205	-3,106	03,165	-3,149	-3,466	-3,481
Public debt interest	-80	-635	-724	-820	-998	-1,271
Others	-125	-2,471	-2,441	-2,329	-2,468	-2,210
Balance on Current A/C	-138	-2,198	-2,131	-2,790	-6,762	-6,501
Capital Inflow						
Public M + LT loans						
Disbursements	(1,120)	(1,939)	(2,864)	(3,203)	(4,981)	(5,600)
Amortisation	(-212)	(-1,355)	(-987)	(-1,001)	(-1,376)	(-1,699)
Net disburesments	908	604	1,877	2,202	3,605	3,901
Grants	75	52	76	67	100	100
Direct Investment	538	217	140	139	276	350
Other (net)	-1,392	-1,381	1,488	-606	-499	2,420
Change in Reserves	9	-1,690	-2,736	988	3,280	-270
Memo Itens						
Net official reserves	920	4,606	7,342	6,354	3,074	3,344
Net foreign assets of banking system		6,906	10,787	11,154	6,674	6,144

Source: World Bank: Indonesia: Policies for growth with lower oil prices, May 12, 1983, Report No. 4279-IND.

a/ Preliminary statistics:

	($ million)
Exports	18,751
Oil + LNG (gross)	14,858
Balance on Current A/c	-6,715
Change in Reserves	3,280

The Indonesian Government reacted quickly and energetically to the immediate crisis. The oil price subsidy which had already been reduced in the two preceding budgets was cut further, both to relieve the budget and to discourage domestic consumption. Public sector wages and salaries were frozen for the second year in succession. The rupiah was again devalued (by 27.5 per cent), in the first instance to reverse capital outflow but also to offset the fall in oil tax revenue and to provide price incentives to non-oil exports. The public investment programme was drastically pruned, many large capital and import intensive projects being dropped, deferred or reduced in scope. To stimulate domestic resource mobilisation, the banking system was partially deregulated and a major tax reform prepared.

Clearly, Indonesia faces leaner years. There is little reason to believe that world oil prices will rise in real terms before the end of the decade, and while LNG exports will help fill the gap, exportable surpluses of oil will inevitably decline and may disappear by the end of the century. The fourth Five Year Plan, due to come into operation on 1 April 1984, envisages a 5 per cent growth rate of GDP and 9.5 per cent of manufacturing, a good deal less than that achieved during the 1970s, yet even this will strain available external and domestic resources.

In order to keep external borrowing and debt within acceptable limits, it will be essential to promote non-oil exports and, where it can be achieved reasonably economically, further import substitution. At the same time, the pattern of economic development must give high priority to the generation of productive employment for the growing work force. For both these reasons, Indonesia's economic future depends crucially on an appropriate and efficient pattern of industrial development. The main burden of providing the jobs will inevitably fall on the service sector. But manufacturing can and must make a contribution.

Chapter II. The Industry Sector: Past Performance

2.1 Overview of the Manufacturing Sector

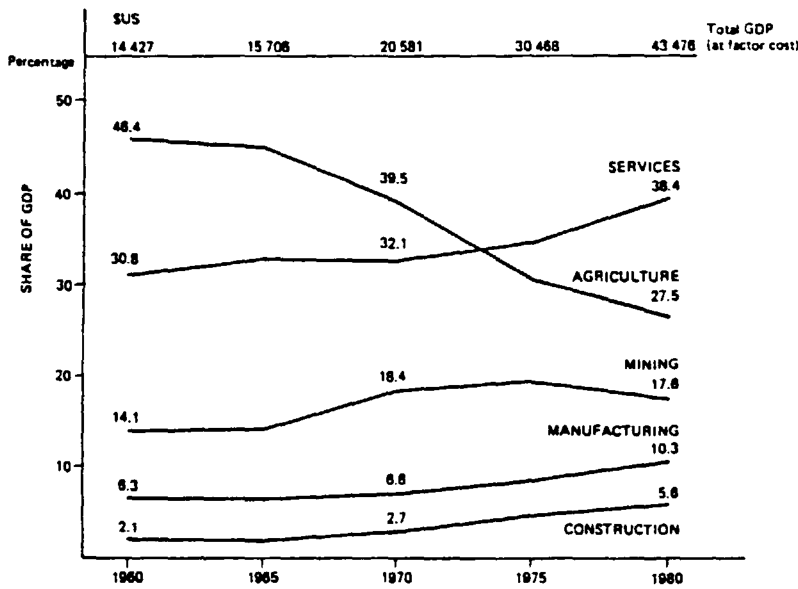
Indonesia is officially designated a "lower middle income" developing country. In 1980, the share of the Indonesian large and medium manufacturing sector[1/] in GDP was 10.3 per cent (at constant 1975 prices), compared with 6.8 per cent in 1970 and 6.3 per cent in 1960 (Figure I). The oil price increases of 1973/74 and 1979/80, by raising the value added of the mineral (oil) sector, reduced the contribution to GDP of all other sectors including manufacturing. Thus, the share of manufacturing in 1980 which had risen to 15.3 per cent at 1973 prices was only 8.8 per cent at current prices (Annex Tables 3 and 29).

Among other large developing countries, only Bangladesh and Nigeria had a smaller manufacturing sector (8 and 5 per cent of GDP at current prices respectively) (Figure II). By contrast, the shares were 29 per cent for the Republic of Korea and Hong Kong and 28 per cent for Singapore. In absolute terms, however, the Indonesian manufacturing sector has grown to a considerable size. Manufacturing value added amounted to US$ 6,154 million in 1980, slightly larger than in Thailand, Hong Kong and Nigeria (Figure III). Among the Asian developing countries, only the Peoples Republic of China, India (US $ 28.5 billion), Republic of Korea (US $ 17.4 billion), Iran (US$ 15.6 billion) and the Philippines (US $ 9.1 billion) had larger manufacturing sectors in terms of value added.

Another indicator of the level of industrial development which is perhaps less appropriate for large countries is manufacturing value added per capita. According to this measure, Indonesia's level of industrialisation is comparatively low, amounting to US $ 41 in 1980, equivalent to the figure in India. Among the countries represented in Figure IV, only Sri Lanka (US $ 30) and Bangladesh (US $ 11) had lower per capita figures.

1/ Unless otherwise indicated, manufacturing refers to the modern organised sector of large and medium-scale enterprise with more than 20 employees.

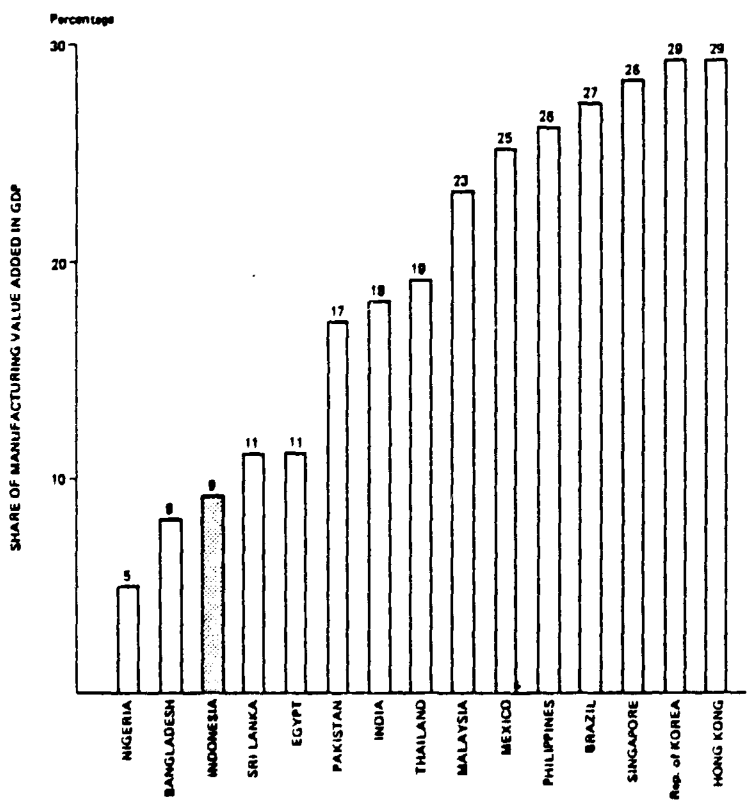
Figure I: Share of GDP by economic sector, 1960-1980[a/]



Source: UNIDO data base. Information supplied by the United Nations Statistical Office with estimates by the UNIDO secretariat.

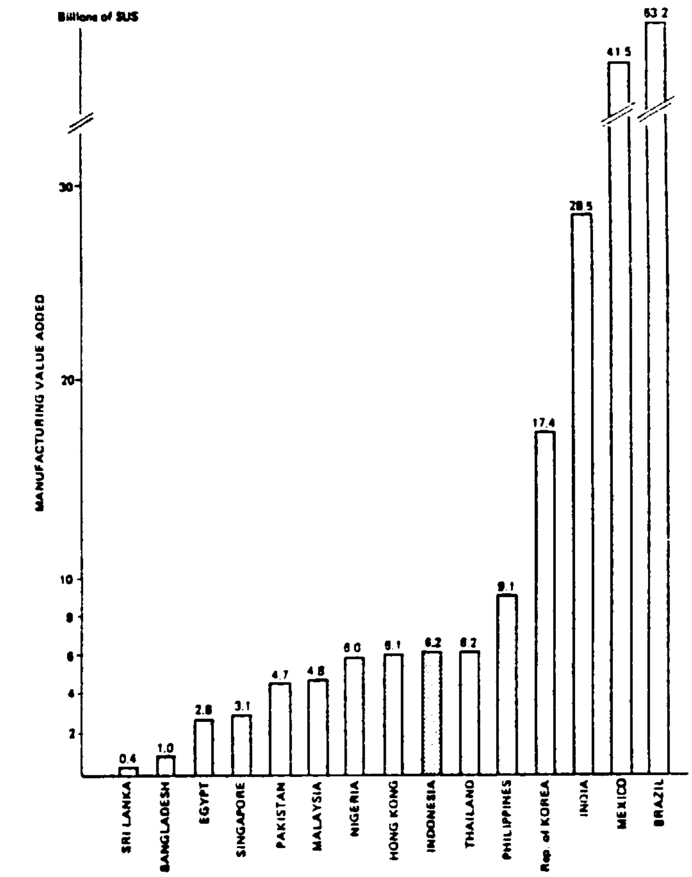
a/ At constant 1975 prices in million US$.

Figure II: Share of manufacturing value added in GDP 1980; selected Asian and large countries



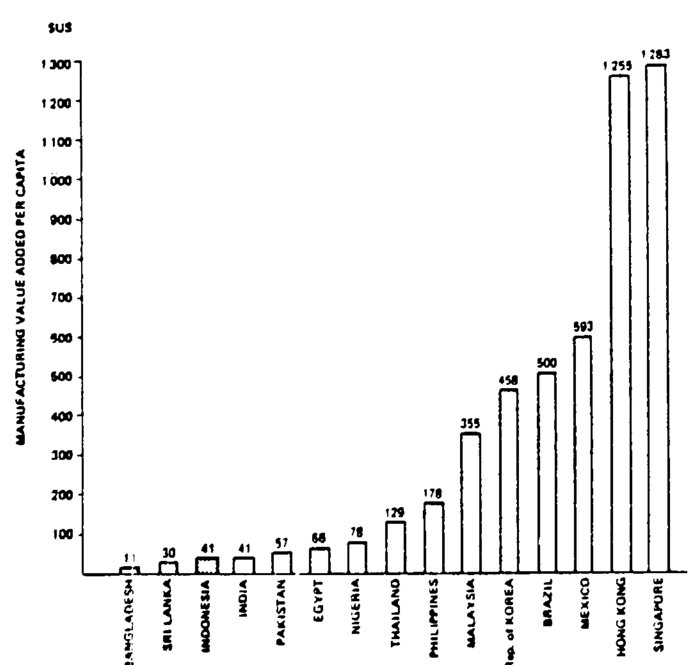
Source: UNIDO data base. Information supplied by the United Nations Statistical Office with estimates by the UNIDO secretariat (Annex Table 1).

Figure III: Manufacturing value added in billion US$ 1980; selected Asian and large countries



Source: UNIDO data base. Information supplied by the United Nations Statistical Office with estimates by the UNIDO secretariat (Annex Table 1).

Figure IV: Manufacturing value added per capita 1980; selected Asian and large countries



Source: UNIDO data base. Information supplied by the United Nations Statistical Office with estimates by the UNIDO secretariat (Annex Table 1).

2.2 Growth of Value Added in Manufacturing

The emergence of a modern industrial sector in Indonesia is of fairly recent origin. After decades of discouragement of manufacturing, the Dutch promoted the development of a cotton weaving industry in the 1930s, to counter the effects of the great depression. In the 1950s, efforts were made by the governments of the new Republic to add a spinning sector consisting mostly of aid-financed state enterprises, and some other modern factories producing tyres, batteries, electric bulbs and similar products.[1/] But in general, as indicated in the preceding section, during the 1950s and the first half of the 1960s, the economic and political climate was unfavourable for industrial development.

The new industrial policies adopted by the Soeharto Government in 1966 marked a dramatic departure. They contributed in three major ways to an improvement of the climate for industrial growth.[2/] First, the foreign trade regime was liberalised and simplified, thereby easing the supply bottlenecks of raw materials and capital goods. Secondly, the preferential treatment previously accorded to state enterprises was reduced and growth of the private sector encouraged. Thirdly, a new foreign investment law (1967) reversed the previous hostility to multinationals and offered tax and other incentives to foreign investors.

The new policies have provided a strategic framework for a marked acceleration in the growth of the manufacturing sector which has made it, next to construction, the most dynamic sector of the Indonesian economy since 1970 (Table II.1). In contrast to real annual growth rates of only 1.9 per cent in 1953-59,[2/] 1.5 per cent during 1960-65 and 7.3 per cent during the recovery years 1965-70, industrial growth reached 14.2 per cent during 1970-75. During 1975-80 growth slowed down somewhat, to an average rate of 10.6 per cent, and the international recession reduced it marginally further to 9 per cent during

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1/ A. R. Soehoed, "Manufacturing in Indonesia", Bulletin of Indonesian Economic Studies, No. 8, October, 1967; also P. McCawley, Industrialisation in Indonesia, Occasional Paper No. 13, Development Studies Centre, Australian National University, 1979

2/ For a survey of Indonesian Economic Development during the 1970s, see A. Booth and P. McCawley, The Indonesian Economy during the Soehoed Era, Oxford University Press, Kuala Lumpur, 1981.

1980-81. Preliminary estimates indicate a growth rate of only 1.0-1.5 per cent in 1981-82, mainly reflecting cuts in government expenditures in response to the fall in oil revenues.

Table II.1: Indonesia: average annual rate of growth of GDP and various sectors 1960-1980
(based on constant 1975 prices in US $)

	1960/65	1965/70	1970/75	1975/80	1960/70	1970/80	1960/80
Agriculture	1.1	2.8	3.5	4.3	2.0	3.9	2.9
Mining and quarrying	1.8	11.3	9.5	5.0	6.4	7.3	6.9
Manufacturing	1.5	7.3	14.2	10.6	4.4	12.3	8.3
Utilities	8.8	12.8	12.7	11.5	10.8	12.1	11.5
Construction	-1.6	14.4	20.5	11.4	6.1	15.9	10.9
Services	2.8	5.3	9.8	9.6	4.0	9.7	6.8
Gross domestic product	1.7	5.6	8.2	7.4	3.6	7.8	5.7

Source: UNIDO Data Base, information supplied by the United Nations Statistical Office with estimates by the UNIDO Secretariat. (Annex Table 2).

By international standards, the growth of the Indonesian manufacturing sector during the 1970s has been quite remarkable. As Table II.2 shows, only six developing countries exceeded the Indonesian rate for the decade 1970-80, including Rwanda (25.7 per cent), Libya (24.3 per cent), Gabon (19.5 per cent), the Republic of Korea (16.6 per cent), Bangladesh (13.6 per cent) and Iran (12.8 per cent). The Indonesian manufacturing sector also made the sixth largest absolute contribution of 3.4 per cent to the overall increase in manufacturing value added of all developing countries during 1973-80; it was exceeded only by Brazil, Mexico, Republic of Korea, India, Iran and followed by Thailand and the Philippines (Table II.3).

Table II.2: Developing countries: average annual growth rates of GDP and manufacturing value added 1960-70 and 1970-80
(ranked in descending order of MVA growth 1970-80, selected countries)

	Average Annual Growth Rate			
	GDP		MVA	
	1960-70	1970-80	1960-70	1970-80
Rwanda	4.4	7.7	21.0	25.7
Libyan Arab Jamahiriya	23.0	3.1	9.1	24.3
Gabon	9.1	10.8	2.0	19.5
Korea, Republic of	8.6	9.5	17.6	16.6
Bangladesh	3.0	5.3	5.4	13.6
Iran	9.4	2.8	10.6	12.8
Indonesia	3.0	7.7	3.0	12.5

Source: UNIDO, *Industry in a Changing World*, UNIDO (United Nations publication, sales no. E.83.II.B.6).

The period in which the Indonesian manufacturing sector grew rapidly, especially 1969-75, provided particularly favourable conditions for industrial development for a number of reasons. The initial industrial base was small and shortages of many industrial goods implied a large potential demand. Much existing capacity needed only modest replacement and repair investment to be capable of adding quickly to industrial output. The foreign and domestic investment laws of 1967 created a favourable investment climate which generally benefited the manufacturing sector as a whole. Finally, there was still ample scope for import substitution, expecially in textiles and other mass consumption goods. Many of these conditions favourable to industrial progress have gradually petered out. Since the mid-1970s, therefore, the Indonesian manufacturing sector has confronted new circumstances, problems and challenges demanding adjustment to more complex conditions.

Table II.3: Contribution of selected developing countries to the increase of MVA of developing countries, 1973-80[a/]
(based on costant 1975 US $)
(percentage)

Brazil	27.2
Mexico	11.2
Republic of Korea	8.3
India	7.2
Iron	3.6
Indonesia	3.4
Thailand	3.3
Philippines	2.8
Turkey	2.7
Egypt	2.5
TOTAL	72.2

Source: UNIDO Industry in a Changing World, UNIDO (United Nations publications, sales no. E.83.II.B.6).

a/ Based on data available for 97 developing countries.

One pervasive difficulty was the emergence, especially after the first OPEC oil price increase in 1973/74, of a strong oil export sector which resulted in an appreciation of the real exchange rate. The combination of relatively high domestic inflation rates and unchanged nominal exchange rates from 1971 to 1978 put severe pressure on all non-oil traded goods industries. While the manufacturing sector benefited from government expenditure out of additional oil revenues and was given substantial shelter in the domestic market by tariff and other protection, its competitive position in export markets was weakened. Two successive devaluations of the rupiah, in 1978 and 1983, brought relief by improving, at least for a while, the competitiveness of Indonesian manufacturers but added to the problems of industries depending on imported raw materials or components.

2.3 Structural Changes in Manufacturing

The high rate of industrial growth during the 1970s greatly diversified the structure of the Indonesian manufacturing sector. As Table II.4 shows, there was very high growth in some branches which had been quite unimportant at the beginning of the decade, among them iron and steel, electrical machinery, other non-metallic mineral products (chiefly cement), rubber products and fabricated metal products. Medium growth occurred in industrial chemicals (chiefly urea), wood products (except furniture), glass products, and paper and paper products. As was mentioned before, many of these fast growing industries were relatively capital intensive. In contrast, some of the larger traditional industrial branches grew less rapidly, including food products, textiles, beverages and tobacco. Growth was also modest in industries producing transport equipment and other chemicals and in petroleum refining, but in the latter as in some other capital-intensive industries, large-scale expansion was still under way at the end of the period.

Diversification led to a marked structural shift in the composition of manufacturing value added. The traditional industries related to the agricultural sector - food processing (chiefly rice milling), beverages and tobacco - which in 1971 accounted for 63.8 per cent of total manufacturing value added, declined to 31.7 per cent in 1980 (Table II.5). The importance of the textile industry rose in the early 1970s but then declined to 12.4 per cent in 1980, a figure slightly below its share in 1971. Whereas in 1971 no other industrial branch exceeded 4 per cent of total manufacturing value added, by 1980 six new branches surpassed this figure, including other chemicals, wood products, transport equipment, other non-metallic mineral products, electrical machinery and rubber products. Fabricated metal products and iron and steel came close to it.

Table II.4: Manufacturing value added by branch of industry ranked according to average annual growth 1970-1980 (based on values in 1975 US $ constant prices)

ISIC		Average annual growth rate Percentage
	- High growth -	
3710	Iron and steel	50.2
3560	Plastic products	33.2a/
3230	Leather products	31.5a/
3830	Machinery electric	30.8
3690	Other non-metallic mineral products	28.7
3820	Machinery, except electrical	27.6a/
3420	Printing and publishing	24.3a/
3550	Rubber products	22.8
3810	Fabricated metal products	20.2
	- Medium growth -	
3510	Industrial chemcials	18.9
3320	Furniture, except metal	18.7a/
3310	Wood products, except furniture	17.6
3620	Glass and products	17.4
3410	Paper and paper products	16.1
3110	Food products	14.1
3220	Wearing apparel, except footwear	12.6a/
3850	Professional and scientific equipment	12.0a/
3900	Other manufactured products	12.0a/
3210	Textiles	11.8
	-Low growth -	
3240	Footwear, except rubber or plastic	10.1
3130	Beverages	9.7
3140	Tobacco	9.4
3530	Petroleum refineries	8.0
3840	Transport equipment	5.6
3520	Other chemcials	3.2
Total manufacturing		11.8

Source: UNIDO Data Base, information supplied by the United Nations Statistical Office, with estimates by the UNIDO secretariat. (Annex Table 4).

a/ 1970-76.

Table II.5: Structural changes of value added in manufacturing, 1971 and 1980 (percentage share in Rp. at current prices)

ISIC	ISIC-description	1971	1980
Total manufacturing		100.0 a/	100.0 a/
3110	Food products	33.9	11.1
3130	Beverages	2.0	1.5
3140	Tobacco	27.9	19.1
3210	Textiles	13.2	12.4
3220	Wearing apparel, except footwear	0.1	0.4
3230	Leather products	0.3	0.2
3240	Footwear, except rubber or plastic	0.6	0.8
3310	Wood products, except furniture	1.4	7.0
3320	Furniture, except metal	0.3	0.2
3410	Paper and products	2.0	1.5
3420	Printing and publishing	2.0	1.5
3510	Industrial chemcials	0.8	4.3
3520	Other chemcials	3.8	7.1
3530	Petroleum refineries	...	...
3540	Misc, petroleum and coal products	0.0	0.0
3550	Rubber products	1.3	4.8
3560	Plastic products	0.5	0.7
3610	Pottery, china, earthenware	0.6	0.2
3620	Glass and products	0.5	1.1
3690	Other non-metallic mineral products	2.5	5.9
3710	Iron and steel	...	3.1
3720	Non-ferrous metals	...	0.0
3810	Fabricated metal products	2.3	3.5
3820	Machinery, except electrical	0.4	1.6
3830	Machinery electric	2.5	5.3
3840	Transport equipment	0.9	6.4
3850	Professional and scientific equipment	0.0	0.1
3900	Other manufactured products	0.3	0.4
Total manufacturing in millions		135,990	2,130,000

Source: UNIDO data base, information supplied by the United Nations Statistical Office, with estimates by the UNIDO secretariat. (Annex Table 5).

a/ 3000 - excluding 3530.

The pattern of structural change in the Indonesian manufacturing sector can be analysed by classifying manufacturing value added roughly by end use as consumer, intermediate and capital goods (Figure V). As would be expected, there was a gradual shift from consumer goods in favour of intermediate and capital goods. From 1971 to 1980 the share of consumer goods in total manufacturing value added declined from 80.8 to 47.6 per cent, while the share of intermediate goods rose from 13.1 to 35.5 per cent and that of capital goods from 6.1 to 16.9 per cent.

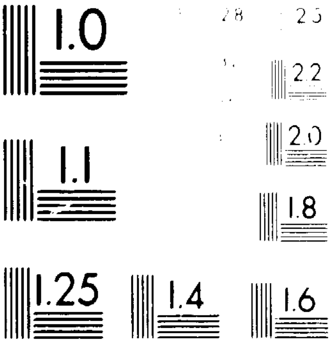
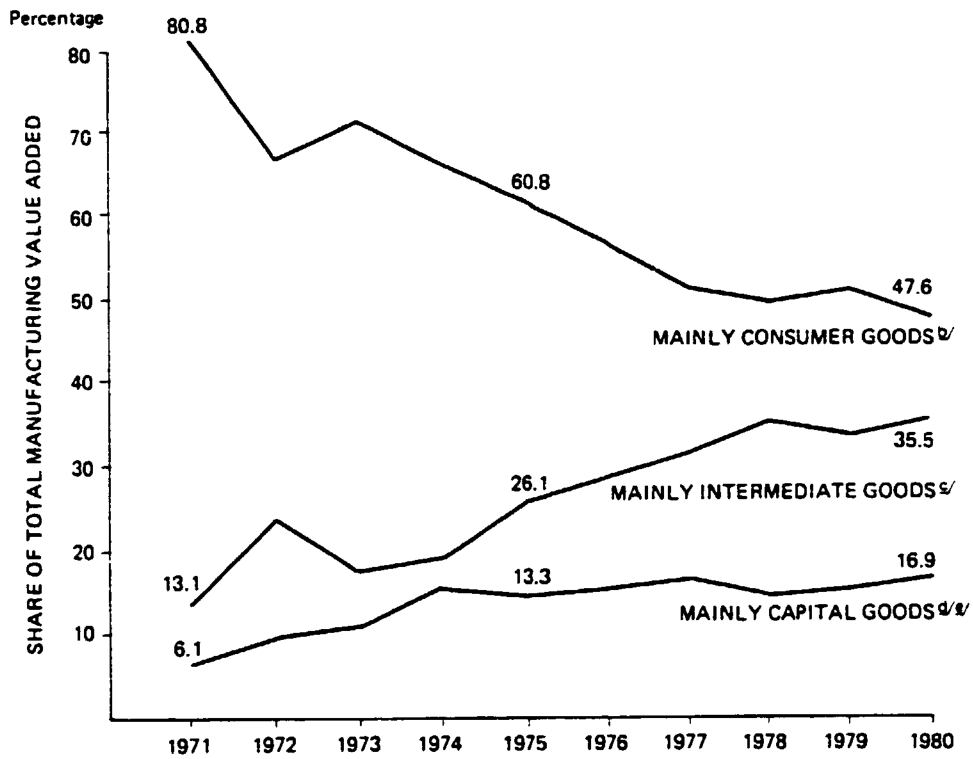

1.0
2.8
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

Figure V: Structural change in Indonesian manufacturing value added according to end use 1971-1980 (based on current Rp. prices)



Source: UNIDO data base, information supplied by the United Nations Statistical Office, with estimates by the UNIDO secretariat. (Annex Table 6).

a/ ISIC 3000 - excluding 3530.
b/ ISIC 3110, 3130, 3140, 3210, 3220, 3240, 3320, 3420, 3610, 3900.
c/ ISIC 3230, 3310, 3410, 3510, 3520, 3530, 3540, 3550, 3560, 3620, 3690, 3710 3720.
d/ ISIC 3810, 3820, 3830, 3840, 3850.
e/ Includes also some consumer durables.

In one important respect, however, the rough classification in Figure V is misleading. It includes among capital goods a range of products of engineering and assembly industries which produce predominantly durable consumer goods rather than producer goods. Among them are motor cars and cycles, sewing machines, refrigerators, air conditioners, TV sets and radios. Table II.6 presents a different classification in terms of output of physical units. It shows relative growth rates of output in four categories -

intermediate goods, capital goods divided into producer and predominantly consumer durables, and other (single-use) consumer goods. It confirms the general shift in the industrial structure towards relatively capital intensive intermediate goods at the expense of (single-use) consumer goods. It also shows that growth of most of the assembly industries producing consumer durables slowed down in the latter period, 1975-81. Both these trends reflect in part the slowdown in growth of domestic demand but also diminishing scope for further import substitution.[1/]

Annex 8 shows that import substitution has in the past decade considerably reduced the share of imports in the Indonesian market for nitrogenous fertiliser and (printing and writing) paper and has virtually eliminated imports of wheat flour (replaced by wheat imports), cotton yarn and woven fabrics, caustic soda and insecticides. Indonesia is now self-sufficient in most food products (except sugar and, for the moment, still rice, as well as some dairy products and tinned foods), textiles (except wool) and oil products. But she continues to rely on imports for most chemical and metallic intermediate products and (not shown in the table) most producer capital goods. Domestic production of the latter is limited, largely confined to diesel engines (69,400 in 1981/82) and hand tractors (1,074 in 1981/82).

These findings are largely corroborated by an examination of the "relative degree of specialisation" during the 1970s. This measure indicates the average value of the ratio between observed and expected level of manufacturing value added where the latter is derived from comparison with all countries (both developed and developing), developing countries and other large developing countries (Annex Tables 9 and 10). The expected values indicate how resource endowments, country size and level of income determine changes in the industrial structure over time. They indicate feasible, though not necessarily desirable or optimal growth patterns.[1/] The results confirm the low degree of overall industrial development in Indonesia (0.65 in relation to other large developing countries) but also the relatively high degree of industrialisation in some branches, such as petroleum refining,

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1/ For an attempt to distinguish growth of demand and import substitution as sources of growth of manufacturing value added in the first half of the 1970s see H. Poot, The Development of Labout Intensive Industries in Indonesia in: The Development of Labour Intensive Industry in ASEAN, edited by Rashid Amjad, Asian Employment Programme, ILO, ARTEP, 1981.

Table II.6. Production of selected manufactures, 1968-80/1

	Unit	1968	1975/6	1980/1	Growth (Annual Rate)	
					1968-75/6	1975/6-80/1
Intermediate products						
Fabricated metal products						
Steel ingots	'000 tons		80 a/	397		123.0
Aluminum extrusion	'000 tons		2	8		27.9
Steel wire	'000 tons		43	143		27.1
Reinforcing iron	'000 tons		202	641		25.9
Aluminum plate	'000 tons		5	12		17.9
Zinc plate	'000 tons		145	294		15.2
Steel pipes	'000 tons		97	154		9.7
Chemicals						
Pesticides	'000 tons		9 a/	26		63.0
Fertiliser (urea)	'000 tons	96	387	1,985	21.0	39.7
Sulphuric acid	'000 tons		15	40		21.1
Acetelene	'000 m³		241	512		16.2
Oxygen	'000 m³		4,914	8,071		10.4
Other						
Paper	'000 tons	11	47	232	23.0	37.2
Cement	'000 tons	410	1,214	5,852	17.1	36.4
Sawn timber	'000 m³		1,819	7,562		32.2
Cardboard	'000 tons		19	55		23.1
Electric/Telecomm. Goods	'000 tons	-	9 b/	19		20.5
Yarn	'000 bales	130	445	1,060	19.2	18.9
Glass (sheet)	'000 tons		62	106		11.3
Crumb rubber	'000 tons		398	611		3.9
Plywood	million sheets		525 a/	618		8.6
Unweighted Average (excluding steel ingots and pesticides)						28.5 (21.5)
Capital goods c/						
Hand tractors	000 units	-	30 b/	877	-	132.5
Storage batteries	000 units	-	480 b/	3,320	-	62.2
Sprayers	000 units	-	20 b/	134	-	60.9
Aeroplanes	units	-	3 a/	12	-	41.4
Diesel Engines	000 units	-	8	34	-	33.6
Hullers	units	-	1,000 b/	1,868	-	16.9
Steel vessels	000 BRT	-	19 b/	28	-	10.2
Helicopters	units	-	13 b/	12	-	-2.0
Unweighted Average (excluding hand tractors)						44.5 (31.9)
Predominantly Consumer Durables d/						
Colour TV sets	000 units	-	3 b/	99	-	139.7
Black and white TV sets	000 units	1	166	631	*	29.6
Refrigerators	000 units	-	10	135	-	26.5
Air conditioners	000 units	-	23	74	-	26.2
Radio cassette recorders	000 units	-	325 b/	617	-	17.4
Automobiles	000 units	2	79	170	*	16.6
Motor cycles	000 units	6	300	410	*	6.5
Radio sets	000 units	350	1,000	1,100	-	2.1
Sewing machinery	000 units	4	520	525	*	0.2
Unweighted Average (excluding colour TV sets)						29.5 (15.8)
Non-durable Consumer Goods						
Cooking oil	'000 tons	23	299	889	*	24.2
Glass bottles	'000 tons	6	32	77	27.0	19.0
Dry batteries	million	52	240	527	24.5	17.1
Textiles	million metres	373	1,017	2,027	15.4	14.8
Clothing	million dozen		14 a/	18		10.5
Electric bulbs	million		22	34		9.4
Detergent	'000 tons		35	54		9.4
Kretek	million packets	24	33	51	4.7	8.7
Cigarettes	million packets	15	24	33	6.9	7.3
Toothpaste	million tubes		108	123		6.8
Washing Soap	'000 tons		165	213		5.2
Matches	million boxes		780	586		-4.6
Unweighted Average						13.7

Source: Central Statistical Bureau, Jakarta.
See also Annex Table 7.

a/ 1979/80
b/ 1976/77
c/ Including manufacture assembly components
d/ Predominantly for private and government use.
* very high growth rate due to low base year.

non-metallic minerals (cement), transport equipment, textiles, rubber products, other chemicals (chiefly pharmaceutical products), food products and wood products (chiefly sawn timber and plywood).

2.4 Employment and Labour Productivity in Manufacturing.

While value added in large and medium-scale manufacturing in Indonesia grew during the 1970s at an average annual rate of over 12 per cent, employment rose by only 7 per cent, from 487,000 in 1970 to 963,000 in 1980. The difference reflects a significant growth in average labour productivity, but it also indicates the failure of manufacturing growth during the decade to have a significant direct effect on Indonesia's employment problem. The increase in the number of jobs found in large and medium-scale manufacturing of 0.5 million represents only one-fifth of the average annual increase in Indonesia's labour force during the period. Indirectly, of course, through the stimulus it has given to transport, trade, finance and other service employment, manufacturing growth has undoubtedly generated additional employment opportunities. Some additional employment may also have been generated in the highly labour intensive small-scale and cottage industry sector which is discussed in the last section of this chapter.

Table II.7 shows growth rates of real value added, employment and labour productivity in the various branches of (large and medium-scale) manufacturing during the decade 1970-80. The figures are in some respects incomplete and are liable to be misleading where value added has grown from a very small base. For what they are worth, they show that as much as 5 per cent of the annual growth of value added in the sector as a whole was accounted for by growth in labour productivity, leaving only 7 per cent for employment generation. The rate of growth of labour productivity was very high in some of the very capital intensive branches, such as non-metallic minerals (cement, 15.3 per cent), non-electrical machinery (17.1 per cent), fabricated metals (8.7 per cent) and industrial chemicals (chiefly urea, 8.1 per cent) and also, rather surprisingly, in food processing and textiles. It should be noted that

1/ For a detailed description of concept and methodology of relative specialization and the country coverage of large countries, see UNIDO Handbook of Industrial Statistics, ID/284, E.82.B.2, 1982.

Table II.7: Average annual growth rates of value added, employment and labour productivity, 1970-80.

	Total	Value Added	Employment	Labour Productivity	Value Added per Employee 1980
		Annual Growth Rates (percentage)			'000 US $
3000	TOTAL	11.8	7.1	4.7	3.5
3110	Food	14.1	5.3	8.8	2.5
3130	Beverages	9.7	13.0	-3.3	7.1
3140	Tobacco	9.4	3.8	5.6	4.1
3210	Textiles	11.8	4.9	6.9	1.8
3220	Wearing apparel, except footwear	12.6	17.8	-5.2	0.9
3230	Leather products	31.5	6.8	24.7	1.7
3240	Footwear, except rubber or plastic	10.1	8.6	1.5	3.5
3310	Wood products except furniture	17.6	55.8	-38.2	4.1
3320	Furniture, except metal	18.7	12.9	5.8	1.0
3410	Paper and products	16.1	10.3	5.8	4.3
3420	Printing and publishing	24.3	5.0	19.3	2.6
3510	Industrial chemicals	18.9	10.8	8.1	10.5
3520	Other chemicals	3.2	7.3	-4.1	5.9
3530	Petroleum refineries	8.0	...	...	...
3540	Misc. petroleum and coal products	...	...	...	...
3550	Rubber products	22.8	20.6	2.2	4.4
3560	Plastic products	33.2	12.4	20.8	1.4
3610	Pottery, china, earthenware	10.1	27.5	-17.4	1.2
3620	Glass and products	17.4	10.9	6.5	4.0
3690	Other non-metallic mineral products	28.7	13.4	15.3	6.5
3710	Iron and steel	50.2	...	...	12.2
3720	Non-ferrous metals	...	...	...	...
3810	Fabricated metal prod.	20.2	11.5	8.7	2.9
3820	Machinery, non-elec.	27.6	10.5	17.1	4.5
3830	Machinery, electric	30.8	27.1	3.7	4.8
3840	Transport equipment	5.6	16.6	-11.0	7.3
3850	Prof.,Sci, equipment	12.0	...	...	2.2
3900	Other	12.0	-0.8	12.8	2.3

Source: UNIDO Data Base, information supplied by the United Nations statistical office, with estimates by the UNIDO Secretariat. (Annex Tables 11, 12, 13 and 14).

no data are available for some of the most capital intensive industries developed in the latter 1970s, especially petroleum refining and other petrochemicals, iron and steel and non-ferrous metals.

The last column in Table II.8 shows the level of labour productivity by industry branch, as measured by value added per employee, in 1980. Compared with the average of US$ 3,500 for the large and medium-scale manufacturing sector as a whole, very high figures are shown, as would be expected, for iron and steel, industrial chemicals, transport equipment, cement and other chemicals, but also for beverages and (at a lower level) paper, glass and electrical machinery. The lowest levels of labour productivity are in garments, pottery and furniture industries.

2.5 Geographical Distribution of Manufacturing

The most comprehensive data on the geographical distribution of large and medium-scale manufacturing at present available are those from the 1974/75 Census of Industry. They are deficient in that they do not include some of the most important industrial activities on the outer islands, those associated with the petroleum and natural gas sector, and because the past eight years have witnessed very large-scale development in these and other natural resource based industries (mineral smelting and plywood) in the outer islands. Both these deficiencies should be remedied when the results of the 1980/81 Census of industry become available. With this reservation, it is of some interest to examine the pattern that existed in 1974/75 (Annex Tables 16, 17 and 18).

Java accounted for 85 per cent of all medium and large-scale enterprises, for 86 per cent of persons engaged and for 83 per cent of value added (Annex Table 15). Another 12 per cent of value added was produced on Sumatra, leaving only 5 per cent for all the rest of the country. It is evident that in 1974/75 modern manufacturing remained (and to only slightly less degree remains) heavily concentrated on Java.

Even after making allowance for the distribution of population, Java is clearly much more industrialised than the other regions, primarily owing to better transport and other infrastructure, government and services. But the interaction is cumulative, in that the concentration of industry in turn promotes concentration of infrastructure investment and service industries. In Java, around 7 per thousand of the population were engaged in manufacturing in 1974/75, while in the outer islands the average was less than 2 per thousand. All efforts to decentralise industrial activity notwithstanding, rapid industrial growth during the 1970s has not lessened this imbalance.

The preponderance of Indonesia's natural resources outside Java, however, establishes a presumption in favour of the development of resource-based industries in the outer provinces, and a good deal of such development has undoubtedly occurred in the past decade. The Indonesian Government has, for this purpose, identified five regional industrial growth centres and has drawn up development plans for these regions, in Northern Sumatra, Southern Sumatra, South Sulawesi, East Kalimantan as well as Java-Bali.

Industrial estates and processing zones have also been set up in various regions to foster regional industrial growth. Apart from the industrial estate at Pulo Gadung (Jakarta), there are at present two others in Java, Rungkut Surabaya (East Java) and Cilacap (Central Java). Two further industrial estates are at an advanced stage of planning and implementation, in Medan (North Sumatra) and Ujung Pandang (South Sulawesi). Among others at a preparatory stage of study or development is one at Batam island, close to Singapore.

2.6 Ownership and Investment Pattern in Manufacturing

In 1974/75 almost one-half of the value added in the Indonesian manufacturing sector was produced by private domestic enterprises, but most of these were medium-size firms in the traditional branches of industry (Annex Table 18A). Their share in total value added has almost certainly declined markedly in the past eight years, while that of government enterprises and foreign-owned and foreign-government/joint ventures has increased.

Since the adoption of the domestic and foreign investment law in 1967, the manufacturing sector has attracted a good deal of foreign as well as domestic private investment. Table II.8 shows approved and realised foreign investment by industry during the periods 1967-75 and 1976-81. The share of manufacturing in approved foreign investment rose from 62.4 per cent in the earlier period to 75.6 per cent in the latter period, chiefly because of relative decline in large-scale planned investment projects in mining in the early years many of which did not reach full realisation. In regard to domestic investment the proportion channelled into manufacturing was 66 per cent for the 1967-81 period (Annex Table 19). The share of manufacturing in realised foreign investment expenditure was higher in the latter than in the former period but, somewhat surprisingly, the proportion of planned investment realised was below the average for all foreign investment. Among major

Table II.8 Approved and realised (implemented) foreign investment projects by sector, 1967-1981[a/]
(Millions of $)

Sector	1967-75	1976	1977	1978	1979	1980	1981	Total Value	Total Project	Implementation rate[d/]
			A. Approved foreign investment (all sectors)							
Agriculture, forestry and fishery	303.9	34.8	57.7	64.8	108.9	114.6	231.7	916.4	151	
-Agriculture	77.1	9.2	26.3	3.1	25.9	43.3	25.9	210.8	57	
-Forestry	178.3	18.4	28.7	38.6	42.7	68.9	184.2	559.8	70	
-Fishery	48.5	7.2	2.7	23.1	40.3	2.4	21.6	145.8	24	
Mining	1,046.6	10.9	200.5	43.0	150.0	3.0	1.8	1,455.8	16	
-Metal	895.6	10.9	200.0	26.9	150.0	---	1.8	1,285.2	6	
-Others	151.0	---	0.5	16.1	---	3.0	---	170.6	10	
Manufacturing	3,015.2	346.8	357.7	275.4	1,530.6	712.3	873.5	7,111.5	474	
-Food	122.4	70.9	8.4	5.5	66.9	15.6	40.5	330.2	47	
-Textiles + leather	887.8	31.1	71.1	114.6	103.4	79.8	141.9	1,429.7	73	
-Wood + wood products	37.8	5.5	---	1.0	6.0	11.2	123.6	185.1	20	
-Paper + paper prod.	31.1	66.3	9.7	0.4	10.5	2.4	48.5	168.9	12	
-Chemicals + rubber	289.4	28.3	79.3	25.4	365.1	281.7	275.5	1,344.7	134	
-Non-metallic minerals	357.4	71.4	98.3	19.7	78.7	22.1	20.1	867.7	32	
-Basic metals	1,084.9	11.6	18.4	9.9	854.9	---	80.6	2,060.3	23	
-Metal products	198.8	61.5	72.5	92.0	45 1	98.8	142.8	711.5	126	
-Others	5.6	0.2	---	6.9	---	0.7	---	13.4	7	
Construction	61.4	1.8	3.9	5.4	0.5	5.7	48.8	127.5	63	
Trade + hotels	154.7	13.1	7.0	9.7	3.0	38.6	---	226.1	15	
-Trade	11.0	0.7	---	---	---	---	---	11.7	3	
-Hotels	143.7	12.4	7.0	9.7	3.0	38.6	---	214.4	12	
Transportation + communication	40.7	4.2	---	---	0.2	32.5	0.1	77.7	18	
-Transportation	40.7	4.2	---	---	0.2	32.5	0.1	77.7	18	
-Communication	---	---	---	---	---	---	---	---	---	
Services	209.8	27.2	20.3	4.4	45.7	---	23.4	330.8	50	
-Trade serv.	195.1	27.2	20.3	2.4	45.7	---	23.4	314.1	39	
-Personal serv.	14.7	---	---	2.0	---	---	---	16.7	11	
	4,832.3	438.8	647.1	402.7	1,838.9	906.7	1,179.3	10,245.8	787	
			B. Realised (implemented) foreign investment in manufacturing							
Manufacturing Total	1,425.4	301.2	186.2	267.0	192.0	235.4	243.5	2,850.7	386	40.1%
-food	125.6	10.8	11.9	14.9	7.1	7.4	15.8	193.5	40	58.6%
-textiles + leather	625.2	91.8	27.9	31.4	41.7	78.7	102.5	999.1	60	69.9%
-wood + wood prod.	16.1	4.6	1.4	0.4	0.1	3.3	2.2	28.1	8	15.2%
-paper + paper prod.	32.6	3.3	9.6	11.8	1.4	6.1	2.5	49.3	10	29.2%
-chemicals + rubber	192.2	45.7	28.0	71.7	44.8	32.0	44.5	458.9	117	34.1%
-Non-metallic minerals	139.5	71.3	42.9	9.0	3.2	30.0	30.9	326.8	23	37.7%
-Basic metal	81.1	30.7	27.8	37.8	47.5	23.9	7.9	256.7	19	12.5%
-Metal prod.	221.0	42.4	35.4	89.9	36.0	52.0	35.3	512.0	102	72.0%
-Others	10.2	0.6	1.3	0.1	10.2	2.0	1.9	26.3	7	196.3%

Sources: Bank Indonesia, Report for the Financial Year 1981/82 (approved investment). BKPM and Bea Cukai (Import) and Monthly Bulletin of Foreign Exchange Banks (cash in flows) (realised investments).

a/ After taking into account the cancellations and shifting of projects from foreign to domestic investment.
b/ Revised figures.
c/ Through September 1981.
d/ Ratio of approved to realised investment.

branches of manufacturing, textiles has shown by far the largest total and one of the highest realisation rates over the period as a whole (70 per cent), while the low realisation rate for basic metals (12 per cent) shows that some ambitious early plans did not reach fruition. Foreign investment showed the same tendency as public investment to concentrate on the capital intensive branches of the manufacturing sector in the latter period, with particularly large increases in chemical, mineral and metal processing and fabricating industries. The bulk of approved foreign investment in manufacturing originated in Japan and Hong Kong (Annex Table 20).

2.7 Exports and Imports of Manufactures

A striking feature of the Indonesian manufacturing sector is the small share of manufactures in total exports and the predominance of manufactures in total imports. The trade deficit in manufactures increased from US $ 3.6 billion in 1975 to US $ 6.4 billion in 1980. (Annex Table 21).

The significance of manufactures in Indonesia's exports varies with the definition adopted. A widely used broad definition which includes processed goods with only a small proportion of value added by manufacturing yields a figure of 13.4 per cent for the share of manufactures in total exports in 1980. But the share in total exports of items which would normally be regarded as manufactures, i.e. with a high degree of manufactured content, was only 2.3 per cent in the same year. Irrespective of the definition used, the share of manufactures increased only marginally during the 1970s. But it needs to be remembered that total exports increased greatly with the oil boom. In absolute terms there has been a quite impressive increase in manufactured exports, although it chiefly occurred in two spurts, 1978-79 and 1982-83.

The first of these, mainly in textiles, garments and electronic goods, reflected partly increased capacity and favourable demand conditions in world markets, but was stimulated also by tight domestic markets, which induced manufacturers to look actively abroad, and by the November 1978 devaluation. This boomlet, however, petered out in 1980 when the second oil price increase boosted domestic demand and raised the real effective exchange rate, thus worsening the international competitiveness of Indonesian manufactures. A second mini-boom got under way in 1982, chiefly concentrated on plywood and electronic assembly products (Table II.9). How substantial and enduring a stimulus it received from the March 1983 devaluation remains to be seen.

The Indonesian Government has been conscious of the need to promote non-oil exports, especially since the decline in oil export earnings that began in 1981. A National Agency for Export Development (NAFED) has been active for some years. More recently state enterprises have been encouraged to look for export markets. A counterpurchase policy was adopted in 1981, designed to promote non-oil exports by linking contracts with suppliers of capital equipment for overseas-financed development projects with equivalent purchases of Indonesian exports. The two devaluations of the rupiah of 1978 and 1983 also partly served the same objective.

Table II.9: Exports of manufactures, 1977-82
($ million)

	1977 (50%)	1978 First half	1979 First half	1982 First half
Labour Intensive Products				
Textile yarn	0.2	0.4	9.8	..
Cotton fabric	0.1	0.2	5.6	2.5
Woven fabric	0.1	0.1	55.6	14.5
Floor coverings	0.1	2.0	9.6	0.5
Electrical machinery	2.7	5.1	16.2	
Telecommunications app.	..	1.2	17.2	50.3
Other electrical app.	13.2	22.8	164.2	
Clothing	2.4	11.2	103.1	49.0
Leather	1.4	3.7	16.5	..
	20.2	46.7	397.8	116.8
Processed Timber				
Plywood and veneer	8.0	15.8	49.8	114.8
Wood manufactures	1.8	1.6	10.6	3.2
	9.8	17.4	60.4	118.0
Other manufactures				
Pharmaceutical	3.9	8.1	9.5	2.4
Essential oils	6.0	11.0	31.0	9.4
Pig iron	2.0	13.6	0.0	0.0
Iron rods	0.0	0.0	60.3	
Tubes and pipes	0.0	2.1	19.2	25.7
Iron and steel casings	0.0	0.0	10.1	
	11.9	34.8	130.1	37.5
Total (listed products)	41.9	98.8	588.3	372.3

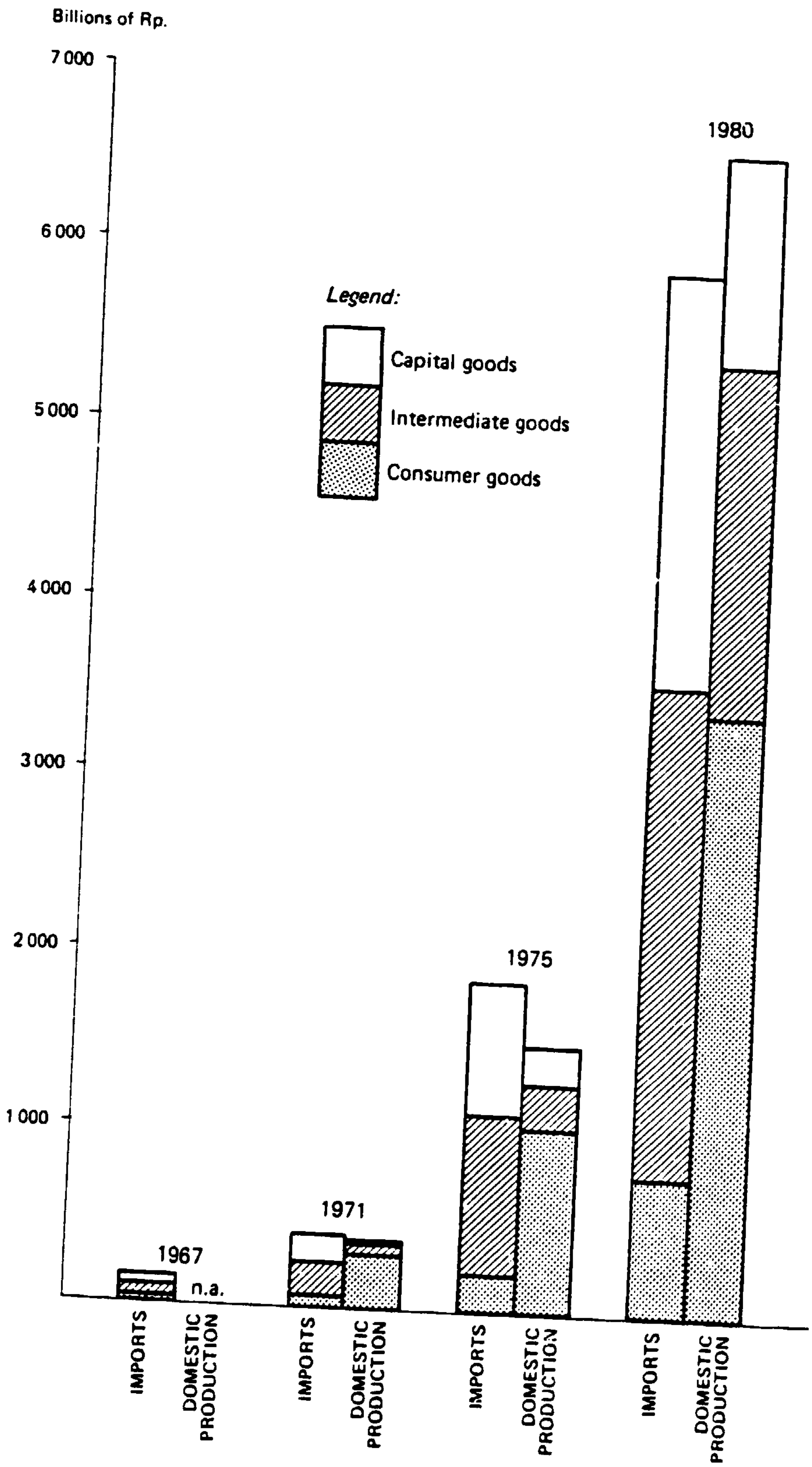
Source: 1977-79: Garnaut (1979, p.34); sawn timber has been omitted from the total.
1982: Central Statistical Bureau, Ekspor Jan-Juni 1982.

The limited role of manufactured exports epitomises the inward-looking character of the Indonesian manufacturing sector (Annex Table 22 and 23). It contrasts in this respect with many other Asian developing countries where exports of manufactures have performed an important function as a driving force in the industrialisation process. The performance of the four east Asian NICs is best known but, (as Annex Table 32 shows), several other Asian developing countries have also recorded much higher shares of manufactures in exports than Indonesia.

Despite the rapid industrial growth of the 1970s and the considerable progress in import substitution for particular categories of manufactures which was noted above, Indonesia's overall dependence on imports of manufactures has risen rather than fallen during the period. Whereas in 1971 imports of manufactures had been equivalent in value to 11.2 per cent of GDP, by 1980 the ratio had risen to 13.3 per cent, largely a reflection of the tendency of total imports and especially imports of capital goods to keep up with rising availability of foreign exchange. But, as Figure VI shows, by 1980 domestic production of manufactures had surpassed imports, a landmark of a kind. Somewhat surprisingly, the commodity composition of imports classified by end use showed some rise in the share of consumer goods at the expense of intermediate and capital goods, while domestic production underwent a more substantial change in the opposite direction with a tripling in the share of capital goods, from 5.7 per cent in 1971 to 17.6 per cent in 1980 (Annex Table 24). It must again be noted, however, that the bulk of domestically produced capital goods were predominantly consumer durables.

As regards the geographical pattern of Indonesia's trade in manufactures, the main countries of origin of Indonesian imports were the developed market economies, particularly the EEC and Japan, which together provided 85 per cent of imports of manufactures (narrow definition) (Annex Table 25) in 1980. The main markets for Indonesia's exports of manufactures (narrow definition) were other developing countries (65.3 per cent), followed by EEC (15.0) and Japan (8.4 per cent) (Annex Table 26). But the share of developing country markets in this classification is inflated by the practice of classifying as exports to Singapore a substantial volume of trade (especially of electronic goods and plywood) for re-export to the USA and other developed country markets.

Figure VI: Imports and domestic production of manufactured goods by end use 1967-1980
(billion. Rp. current prices)



Source: Annex Table 24.

An examination of exports and imports according to stage of processing reveals some potential linkages between trade and industrialisation (Annex Table 27). On the export side, the high though declining share of raw materials for further processing (72.1 per cent in 1980) suggests a potential for further industrial development based on processing before export. In fact, while there was a slight increase in the relatively small volume of exports of processed goods for final use during the decade (from 4.7 to 7.5 per cent), the share of exports for further processing actually declined slightly (from 6.6 to 5.3 per cent). On the import side, similarly, the high share of processed goods for final use (69.3 per cent) might be taken as prima facie evidence of scope for further import substitution. But it need hardly be stressed that such import substitution will need to be selective, in accordance with Indonesia's capacity to process efficiently, if downstream local industries are not to be handicapped.

2.8 Small-Scale and Household Industries

This survey of the Indonesian manufacturing sector has so far dealt only with medium and large scale industry, in other words, with the modern sector. This is certainly the most important in terms of output. In 1979, it accounted for nearly four-fifths of value added in manufacturing. But there is also in Indonesia a large and diffuse traditional sector of small-scale and household or cottage industry which, while it accounts for little more than one-fifth of value added, is overwhelmingly more important in terms of employment.

According to the official statistics summarised in Table II.10, small-scale and household-cottage industry accounted together for 87 per cent of manufacturing employment in 1974/75 and for 81 per cent in 1979, the last year for which such statistics are available. But these statistics, as the footnotes to the table point out, are for a variety of reasons to be taken as merely the roughest guide to relative magnitudes. In particular, the 1979 survey of household and cottage industries included only regular workers and therefore yielded a much smaller employment total than the 1974/75 Census. A large proportion of workers in household industry are family workers working part-time and intermittently and, by almost any criterion, are to be regarded as underemployed. Similarly, the apparent increase in the number of small-scale (and probably also household-cottage) enterprises between 1974/75

Table II-10. Manufacturing Sector, by Size of Enterprise, 1974/5, 1979

	1974/5				1979				1980	1981
	LM	S	HC	Total	LM	S	HC	Total	LM	LM
1. Number of enterprises ('000)	7	48	1,235	1,290	8	113	1,418	1,539	8	8
2. Persons engaged ('000)	662	343	3,900	4,895	870	827	2,795	4,492	977	1,012
3. Value added (Rp. billion)	476	53	83	613	1,660	187	291	2,139	2,149	2,722
4. Gross output (Rp. billion)	1,294	158	201	1,653					6,904	8,299

Source: BPS, Census of Manufacturing Industries 1974/5
BPS, Small-Scale Industries 1979

a. Several weaknesses in the data should be noted. Firstly, large and medium firm data are for 1974. Data for small firms are for 1975. Data for cottage firms are for August 1974 to July 1975. The data for value added, however, has been deflated to 1974 prices by deflating data for small firms by 20 per cent and for cottage firms by 10 per cent. Secondly, BPS officials suspect that coverage of the small and cottage firms, especially, may have been rather poor and that the estimates (particularly the value added estimates) for these two groups may be substantially understated. Thirdly, while all large, medium and small manufacturing establishments throughout Indonesia were intended to be included in the Industrial Census, cottage firms in rural areas in the following provinces were not covered: Nusa Tenggara Timur, Kalimantan, Timur, Kalimantan Tengah, Sulawesi Tengah, Sulawesi Tenggara, Maluku, Irian Jaya, and the island areas of Riau. It was felt 'that this would not seriously affect the results at the national level' (McCawley, op cit., p. 15.)

b. The increase in the number of enterprises, employment and value added for SE's between 1974/75 and 1980 reflects an improvement in coverage of this type of enterprises rather than a genuine expansion.

c. The 1979 survey of household and cottage industries was based on a household survey and was carried out in the general framework of the national social economic survey programme. It is uncertain to what extent its results can be compared with the household and cottage industry data generated by the 1975 industry census. For example, in terms of workers this survey definition was limited, including only regular workers. It therefore, probably excluded many of the part-time workers which were included in the 1975 census.

and 1979 reflects little more than improvement in statistical coverage. Thesober truth is that very little is known about the small-scale and household cottage sector that lends itself to statistical analysis.

This is not to say, however, that the small-scale and household-cottage sector can be neglected in industrial policy. As one authority has put it, "the extreme heterogeneity of the Indonesian manufacturing sector - average value added per worker in the large and medium firms is almost forty times higher than in the cottage firms - poses a dilemma for Indonesian planners. Employment and anti-poverty objectives suggest that considerable resources should be devoted to helping the 'submerged' cottage sector about which so little it known, while growth objectives are more likely to be served by concentrating on assisting large firms."1/

Even in relation to production of capital goods, the small-scale and household-cottage sector is not entirely negligible. As Table II.11 shows, almost one-half of each sub-sector, small-scale and household-cottage, is concerned with food processing (especially rice milling, but also in rubber, coconut oil and other estate and small holder products). A considerable proportion of the rest consists of handicrafts (batik, wood and stone carving, etc.) and, in the case of small-scale enterprise, of production of tiles, bricks, charcoal, etc. But there is a significant volume of small-scale production of metal products, such as hand tools and small agricultural machines, as well as vehicle components and repair, which needs to be borne in mind in any policy consideration of the capital goods sector.

1/ P. McCawley, Industrialization in Indonesia. Occasional Paper No. 13, Development Studies Centre, Australian National University, Canberra, 1979, pp. 15 f.

Table II.11: Percentage distribution of value added in small-scale (1979) and household and cottage establishments (1974)

Sector		Small-scale	Household/ cottage
311/312	Food	42.0	43.7
313	Beverages	0.9	0.2
314	Tobacco	1.2	1.3
321	Textiles	9.1	5.9
322	Clothing	2.4	1.7
323	Leather	1.1	0.4
324	Footwear	1.3	0.7
331	Wood products	9.5	21.1
332	Furniture	6.1	0.2
341	Paper	0.1	0.2
342	Printing	2.4	0.3
351/352	Chemicals	2.8	0.5
355	Rubber products	0.5	0.4
356	Plastics	1.4	0.5
361	Pottery	0.2	0.1
363	Cement and prod.	3.3	1.3
364	Struct. clay products	6.0	8.8
369	Other building materials	0.4	0.4
381	Metal products	4.5	3.1
382/383	Machinery	0.7	1.0
384	Transport equipment	2.2	0.5
385/390	Other manufacturing	1.1	2.0
Total		100.0	100.0

Sources: BPS, Small-scale Industrial Industries, 1979.
BPS, Census of Manufacturing Industries, 1974/75.

Chapter III. The Industry Sector: Prospects

3.1 Introduction

The purpose of this chapter is to examine prospects and strategies for industrial growth in Indonesia during the decade of the 1980s. One of the conditioning factors for the prospects is Indonesia's volatile external economic environment. One of the major considerations that must influence industrial strategy is Indonesia's pressing employment problem.

Demand for the products of Indonesia's manufacturing sector is determined by three factors. One is the size and composition of total domestic demand for manufactures; the second is the relative share of imports in the domestic demand for manufactures; the third is the size and composition of manufactured exports. The second and third of these will depend on the development of the comparative advantage enjoyed by Indonesian manufacturing industries relative to their foreign competitors.

The next five sections deal in turn with the growth prospects for the manufacturing sector as a whole, with prospective changes in comparative advantage, with prospective changes in the composition of domestic demand for manufactures, with priorities in industrial strategy and with sectoral growth projections.

3.2 Growth prospects for the manufacturing sector[1/]

During the 1970s, manufacturing employment and value added grew at an annual rate of 5.3 and 14.9 per cent, as compared with 3.0 and 8.1 per cent for the economy as a whole (Annex Tables 28 and 29). These figures imply an employment elasticity with respect to output growth of 0.36 for manufacturing and 0.37 for the whole economy.

The increase in Indonesia's labour force was, by and large, fully absorbed during the 1970s. Although the additional employment opportunities

1/ In this Chapter manufacturing includes, in addition to the modern sector, also small-scale and household cottage industries. Data are therefore not entirely comparable with Chapter II which is confined to large and medium enterprises.

were, in part, of relatively low quality, this represented a major achievement. The greatest challenge to the economy in the coming decade is to find productive employment opportunities to match the growth of the labour force, as well as raising as far as possible the quality of employment for those at present underemployed. Assuming an unchanged participation rate, the annual rate of growth of the labour force is expected to be 2.6 per cent.

The fourth Five Year Plan assumes an annual rate of growth of GDP of 5 per cent. Clearly, such a growth rate through the 1980s would be inadequate to absorb the new entrants to the labour force unless the employment elasticity can be substantially increased (With an unchanged employment elasticity of 0.37, a 5 per cent rate of growth of GDP would yield an increase in employment at an annual rate of only 1.9 per cent. Or, to put it another way, to achieve a growth rate of employment of 2.6 per cent, with an employment elasticity of 0.37, would require a growth rate of GDP of 7 per cent). A growth rate of GDP of 6 per cent could meet the employment challenge if employment elasticity were to rise to 0.43. Some such rise is possible if, as seems likely, the average labour-intensity of production increases with a decline in the relative importance of the oil sector. In addition, more emphasis on the export of labour-intensive manufactures would raise average labour-intensity of production.

What are the implications of these figures for manufacturing development? Experience of other developing countries at Indonesia's present stage of development suggests an elasticity of manufacturing output growth with respect to GDP growth of 1.5 , and there are reasons to believe that some such relationship will hold for Indonesia in the 1980s. In other words, for GDP to grow at 5 per cent, manufacturing output must grow at 7.5 per cent.

The question presents itself whether domestic demand for manufacturing can be expected to provide a market to absorb output of manufactures growing at this rate. Between 1975 and 1980, GDP grew at an annual rate of 7.5 per cent and domestic demand for manufactures at 10 per cent giving an income elasticity of around 1.3. If this value holds during the 1980s, a growth rate of GDP of 5 per cent, would yield a rate of growth of the domestic market for manufactures of only 6.5 per cent, not enough to absorb the hypothesised output growing at 7.5 per cent. To ensure an adequate growth of demand, the gap must be filled by either further import substitution of by a sufficiently rapid growth of exports of manufactures.

At first sight, it does not matter which of these two ways supplementing growth of domestic demand is chosen. But employment considerations may argue in favour of exports. If, as seems likely, the manufacturing sector has an employment elasticity (labour intensity) below the average for the economy as a whole, faster growth of manufacturing output than of GDP as a whole will tend to reduce average employment elasticity and thus aggravate the employment problem. Yet, as has just been pointed out, manufacturing will almost certainly have to grow considerably faster than GDP as a whole if the target rate of growth of GDP (and employment) is to be attained. One way of resolving this dilemma, or at least alleviating it, would be a strong emphasis on relatively labour intensive manufacturing which, as will be shown below (section 4.3), is most likely to be feasible by means of an export oriented strategy.

For the purpose of projecting prospects and indicating policy options during the 1980s for the manufacturing sector in general and the capital goods industries in particular, an intermediate assumption of a growth rate of GDP of 6 per cent has been made in this study. Given the same elasticity of manufacturing output growth (1.5 per cent), this would imply an annual growth rate of manufacturing output of 9 per cent. To absorb this output, given an income elasticity of demand for manufactures of only 1.3, even more emphasis on import substitution and/or export promotion will be needed. On the other hand, the more ambitious GDP growth rate target would, with an unchanged employment elasticity of 0.37, get closer (2.2 per cent) to the projected growth rate of the labour force of 2.6 per cent.

3.3 Prospects for development of comparative advantage

To make reliable projections of any country's future comparative advantage at a highly disaggregated level is hardly possible. But it may be helpful in assessing likely trends in the pattern of Indonesia's future comparative advantage in manufacturing to draw on the experience of other developing countries with repect to their manufacturing export performance.

The first generation, after Japan, of the newly industrialising countries of east Asian (NICs) which achieved spectacular growth of export of labour-intensive manufactures in the 1960s and early 1970s have since the mid-1970s embarked on the transition from labour to capital and skill intensive products. Their success in this strategy will be relevant to Indonesia and other countries of the region because it will influence the extent to which markets for labour-intensive exports will be vacated. The second generation of NICs includes three of Indonesia's ASEAN partner countries: Malaysia, Philippines and Thailand. All three began intensive efforts to promote manufactured exports in the early 1970s. Malaysia has, with its relatively open economy, gone furthest in promoting exports. In doing so it has relied heavily on export-processing zones and foreign investment. The Philippines and Thailand have followed in Malaysia's footsteps with some years lag.

Annex Table 30 presents data on exports of manufactures for these countries in 1967 and 1975. It shows that in Malaysia almost one-half of the growth in non-resource based manufactured exports was accounted for by various types of light machinery and precision instruments. The share of textiles and clothing amounted to only 3 per cent. Most of the high-growth categories were produced by foreign companies under international sub-contracting arrangements. In the Philippines and Thailand the composition of exports of manufactures remains more traditional. In Thailand much of the growth in exports of manufactures was accounted for by textiles and clothing, as well as precious stones and printed matter. In the Philippines clothing and handicrafts were the most important non-resource-based categories.

Indonesia's opportunities of developing exports of labour-intensive non-resource based manufactures will depend significantly on the competition she will encounter from other Asian developing countries. Competition from the first generation of Asian NICs will diminish as they continue to shift into capital and skill intensive lines. The Republic of Korea alone, which has been exporting in 1975 ten times as much textiles in value as Malaysia, Thailand and the Philippines combined would, by vacating such labour intensive lines, create considerable export opportunities for countries such as Indonesia. Indonesia, however, will need to contend with a new generation of industrialising Asian countries likely to look for export markets for similar labour-intensive products. Among them, the most formidable may be the People's Republic of China, as well as India and other countries of south Asia.

Four other sets of data may help throw further light on the characteristics of manufacturing industries in which Indonesia is most likely to have a comparative advantage.

The first is taken from a UNIDO study[1/] which 1975 export values at 3-digit (and some 4-digit) SITC categories for a group of 74 developing countries, and three samples of developed, NIC's and developing countries have been divided into resource-based and non-resource based industries, ranked by value of exports (Annex Table 31). The table shows, as might be expected, that the share of resource-based exports declines with stage of economic development, from 60.3 per cent for other developing countries to 36.5 per cent for NICs and 30.4 per cent for developed countries. The comparative advantage due to high levels of total factor (capital plus labour) productivity which the more highly industrialised countries obtain from their endowment with human capital (skills, management, technology), less developed countries are most likely to derive from endowment with natural resources. Indonesia is still clearly in the latter category.

The second set of data, in Annex Table 32, compares levels of wages and labour productivity in selected industries in Malaysia, the Philippines and Indonesia in 1974. It shows that wage levels in Indonesia were very much lower than in Malaysia and only two-fifths even of those in the Philippines. But the potential comparative advantage which Indonesian manufactures enjoyed on account of low wages was largely offset (and in some industry groups outweighed) by low levels of labour productivity. In three of the six industry groups (wood, furniture, leather) the ratio of value added to wage was lower in Indonesia than in either of the other two countries, and in the other three (and total industry) lower than in one or the other. Since 1974, the wage differential between Indonesia and the Philippines has probably narrowed (wages rising in Indonesia, but not in the Philippines), but whether there has been a compensating relative gain in labour productivity in Indonesia cannot be demonstrated from available data.

A possible explanation for the higher levels of labour productivity in Malaysia and the Philippines than in Indonesia is greater average capital intensity of industry. More likely the main explanation is to be found in other factors, such as relatively lower average levels of skill, management and organisation of production, for which the regulatory environment may be partly responsible. The conclusion to which this evidence points is that Indonesia cannot be assumed to have an automatic and across-the-board

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1/ UNIDO, World Industry in 1980, New York 1981.

comparative advantage in labour-intensive industries. Her potential advantage due to low wage levels will only be realised in industries and p arts which can show internationally comparable levels of labour productivity.

The third set of data is presented in Annex Table 33 which shows imports by the USA and other developed countries of selected labour-intensive goods and the share of LDCs in these imports. The table shows commodities for which developing countries' shares in the developed countries' imports recorded the largest increases over the period 1965-75. The commodities are ranked according to size of increase. Miscellaneous manufactures (SITC 8) are quite well represented in the list of most successful products. Among them are umbrellas (SITC 89940), leather clothing (84130) and carved manufactures (89910). Annex Table 34, by contrast, represents labour-intensive products which have performed poorly. Manufactured goods (SITC 6) and machinery and transport equipment (SITC 7) show a disproportionately high representation in this list. Some examples are precious stones (66700), textile bags (65610), mechanical goods nec (71980) and agricultural machinery (7120).

Finally, Annex Table 34 presents UNIDO data on product characteristics of 134 manufacturing industries and the development of revealed comparative advantage (RCA) in export for three country samples during the period 1966/7 - 1975/6. The data are classified according to the following typology.

The first product characteristic, RES, refers to the distinction between resource-based (R) and non-resource-based (blank) industries. The performance of resource-based industries, being dependent on natural endowment, cannot be regarded as related to the development process. UNIDO therefore classified with respect to RAC only non-resource-based industries. Three product characteristics are identified as likely determinants of comparative advantage. One is skilled-labour requirement (SK). The second is product development (PD). The third is factor intensity (L or K).

The classification rests on the hypothesis that comparative advantage in exports of manufactures depends, apart from differences in factor proportions, chiefly on skill requirements and on the degree to which the production process is standardised. An industry with relatively high skilled labour requirements will tend to manufacture "new products". Industries producing "new products" will tend to have relatively high skill labour requirement as compared with industries producing "mature products". It seems reasonable to assume that less developed countries will have a comparative advantage in production of the latter. Again, industries may differ in the degree to which producers are able to alter their product characteristics quickly in response to a change in demand or to achieve significant product differentiation. It is likely that developed countries have a comparative advantage in industries with a high degree of product development in this sense.

The three type code columns in Annex Table 34 classify non-resource-based industries according to high (H) or low (L) skill requirements (SK), product development (PD) and capital (K) or labour (L) intensity. In the last three columns data on RCA are presented for the three distinct samples of countries (as in the first set of data above). As indicator of RCA, the export performance ratio (EP) is used. This does not consider import flows which are often substantially affected by the importing country's specified trade policies. (The EP ratio is defined as the relative share of exports of commodity x in a country's total exports of manufacturing as compared with the share of world exports of that commodity to total world exports of manufactures.) Values above unity therefore reflect the fact that the industry's share in the given country's manufactured exports is above the world average. The higher the EP index value, the stronger is the revealed comparative advantage of the country in that industry.

Non-NIC developing countries, such as Indonesia, are liable to have a comparative advantage in primary-product exports rather than in manufacturing, and within manufacturing in resource-based rather than non-resource based products. But within the non-resource-based range of manufactures, their comparative advantage is most likely to be in industries characterised by a low skilled-labour requirement (SK = L), a low rate of product development (PD = L) and high labour intensity (FI = L). The development of RCA over time of such countries may be expected to move generally towards that of NICs and developed countries. The most developed countries are typically characterised by SK = H, PD = H and FI = K. But these are only general tendencies to which there are many exceptions.

The best indication of non-resource-based industries in which Indonesia can expect to acquire RCA is provided by the last column in the table. Industries in which, over the period 1965-76, the sample of non-NIC developing countries has shown a clear and at least not a substantially deteriorating comparative advantage, are likely candidates in this respect. In the medium term, Indonesia may also acquire RCA in industries in which the sample of NICs has shown a clear RCA during the period 1965-76.

3.4 Future Composition of Domestic Demand for Manufactures

As far as domestic demand is concerned, private consumption constitutes an important component. Demand from this source is primarily influenced by population growth and by changes in income. The latter factor can have significant influence on the pattern of consumption. Income related changes in consumption can be broadly represented by income or consumption elasticities.

Estimates of consumption elasticities of selected goods for Indonesia are presented in Annex Table 35. As is to be expected, it shows that elasticities for simple food items are generally low. However, for a number of processed foods elasticities can be fairly high. Elasticities for non-food consumer goods are usually higher than 1 and are highest for luxury and durable consumer goods.

Possibly a more general picture of future structural changes in the manufacturing sector can be derived from experiences in other similar countries. A UNIDO report [1/] presents growth elasticities (with respect to per capita GDP) and size elasticities (with respect to population) of value added per capita for 3-digit ISIC industries, which were obtained from cross section data for large countries, including developing and developed countries. These elasticities have been listed in Annex Table 36.

An examination of the size elasticities of Annex Table 37 reveals that increases in the market size have little effect on production in most cases. In many cases these elasticities are negative, indicating that increases in output are less than proportional to increases in market size, so that per capita output declines. Branches for which market size is important include industries for which large production runs and economies of scale are crucial, for example, machinery, professional equipment, iron and steel and chemicals.

1/ UNIDO World Industry Since 1960; Progress and Prospects, United Nations, New York, 1979.

In these industries, other factors being equal, Indonesia has a certain advantage as compared to smaller countries at similar stages of development because of the size of its domestic market.

The range of growth elasticities indicates that slow growing industries are likely to include food processing, beverages and tobacco, textiles, leather, footwear, wood processing and pottery. The highest growth elasticities occur in the more capital intensive industries producing intermediate products and capital goods.

3.5 Priorities in Industrial Strategy

Official Targets. Since 1969, the Government of Indonesia has included in its Five Year plans objectives of industrial development. These objectives have undergone substantial shifts in emphasis. In Repelita I priority was assigned to industries ancillary to food production and agriculture generally, such as fertiliser, as well as rehabilitation and development of the older import-substitution industries, such as textiles. In Repelita II priorities shifted, with a greater emphasis on social objectives, especially employment creation and protection of pribumi enterpreneurs. Repelita III, with the financial resources provided by the oil boom at hand, widened objectives to include broad-based industrial development on the basis of domestic oil, mineral, timber and other natural resources and the promotion of labour-intensive manufactured exports.

The formulation of targets for industrialisation under Repelita IV is still under way, though the broad outlines have been indicated in various high level official statements. In general, it is proposed that manufacturing should take the place of the oil sector as the main engine of growth. Oil and agriculture will of course remain important, but manufacturing is expected to contribute an increasing proportion of value added, net foreign earnings and employment.

As regards the composition of manufacturing output, promotion of export industries is to receive high priority in order to help fill the gap left by declining oil earnings. Current plans, however, also include further import substitution, especially in the processing of raw materials into intermediate products needed by downstream manufacturers. The development of such industries should also help correct the regional imbalance of manufacturing industries, since most of the raw materials will come from the outer islands.

The Role of Small-Scale Enterprise. As was pointed out in chapter 2.8 above, small-scale and household/cottage industry still accounts for a significant part of value added and the overwhelming majority of jobs in Indonesian manufacturing (Tables II.12 and II.13).

Most small-scale industries are rural based. Often they occur in clusters, where a group of similar types of enterprise are located in one or a few neighboring villages. They are also spread throughout the country, though they are more prevalent in some provinces, e.g. Aceh, Central Java, Jogyakarta, Central Kalimantan, North and South-Sulawesi.

In general, the economic performance of small-scale enterprises is poor. Productivity and incomes are low, and employment in such activities often has a seasonal or part-time character. Therefore, many of the workers can be classified as underemployed. These types of enterprise face a large variety of difficulties including limited access to credit, problems in marketing, poor quality of products, inefficient production techniques, primitive equipment and lack of managerial and vocational skills.

In view of the important role of small-scale enterprises in Indonesia in creating employment, their prevalence in rural areas and their regional dispersion, strategies of industrial development should include the promotion of such establishments. While in the past programmes have been implemented for small industries, the general industrial climate favoured large-scale industrial development. In such an environment these programmes had little chance of success.

Small-scale industries in a number of sectors can have considerable growth potential. They include products for which technology is still labour-intensive such as clothing and footwear. Also industries which rely on closeness to markets can be organised on a small-scale basis such as a number of food processing industries (bakeries, tahu, tempe). Moreover, small-scale industries which are dependent on specific skills or crafts, such as batik and simple metal working and engineering industries, have potential.

Alternative Strategies. In the remainder of this chapter the options open to Indonesian policy makers concerned with industrial development are examined in the analytical framework of two alternative broad strategies, which will be called Strategy A and Strategy B.

Strategy A aims to reduce Indonesia's dependence on world markets and imports. The strategy emphasises the development of manufacturing industries producing for the domestic market for consumer goods, capital goods and intermediate products. In so far as it relies heavily on import-substitution, it may be called an inward-looking strategy. Alternatively, it could be called a strategy of self-reliance.

Strategy B focuses on the development of industries in which Indonesia can be expected to have a comparative advantage in international trade. It tends to emphasise labour-intensive industries, export promotion and small-scale enterprise. It can be called an outward-looking or labour-intensive strategy.

Both strategies have in common a high priority for natural-resource based industries, since both acknowledge that Indonesia's natural resources provide the firmest basis for relatively competitive industrialisation at her present stage of development.

3.6 Projections of Sectoral Growth in Indonesian Manufacturing 1980-1990

Projections of production for industry branches (at the 3-digit level) for the 1980s are presented in Table III.1. The projections have been based on assumed values for growth elasticities relating the growth of each sector to the growth of the manufacturing sector as a whole. The assumed growth elasticities under each of the two strategies are based on the following considerations in relation to the metal-manufacturing branches, leaving all other manufacturing the residual share. Broadly speaking, strategy A reflects the historical development path of Indonesian manufacturing. The growth elasticities for this strategy have, therefore, been based in part on a continuation of the historical pattern, although the experience of another large country with this strategy, Brazil in the 1960s, has also been taken into account. In the specification of growth elasticities for Strategy B, the experience of export-oriented industrialising countries, such as The Republic of Korea (in the late 1960s and early 1970s) and Malaysia has been taken into account.

The effects of the two alternative strategies on value added, and the shares in total manufacturing value added, of the several metal using branches are summarised in Table III.1. It shows that under the labour-intensive strategy (B) the share of these branches in total manufacturing would remain virtually unchanged while under the import-substitution strategy (A) it would increase from 32 to 37 per cent by 1990. But the postition is different for the non-electrical machinery branch (382) which would increase its share in total manufacturing under both strategies.

Table III.1: Projections of manufacturing output at 1980 prices with special reference to metal sectors, 1980-1990

ISIC Sector	Realisation 1980		Projections 1990							
			Strategy (a)				Strategy (b)			
	Value $Rp10^9$	Share (%)	Elasticity	ΔValue $Rp10^9$	Value $Rp10^9$	Share (%)	Elasticity	ΔValue $Rp10^9$	Value $Rp10^9$	Share (%)
371 Iron, steel	700	4.3	1.5	1,436	2,136	5.6	0.8	766	1,466	3.8
372 Non-ferrous basic metal	457	2.8	2.0	1,250	1,707	4.4	1.5	937	1,394	3.6
381 Metal products	515	3.2	1.2	845	1,360	3.5	1.3	915	1,430	3.7
382 Machinery, non-elec.	417	2.6	1.8	1,026	1,443	3.7	1.2	648	1,065	2.8
383 Electrical machinery	300	1.8	1.5	615	915	2.4	2.0	820	1,120	2.9
384 Transport equipment	2,141	13.2	1.0	2,928	5,069	13.2	0.8	2,342	4,483	11.7
3849 Repair of veh.	717	4.4	1.0	980	1,695	4.4	1.0	980	1,697	4.4
OM Other manufac.	10,982	67.7	0.9	13,111	24,093	62.7	1.0	14,783	25,765	67.1
TOTAL	16,229	100.0	1.0	22,191	38,420	100.0	1.0	22,191	38,420	100.0

Sources: Data from Ministry of Industry and calculations by the Netherland Economic Institute.

Iron and Steel. With the completion of part of the Krakatau Steel complex, steel production has become an important industrial sector. The plant, however, is still characterised by low levels of capacity utilisation and large financial losses. Under Strategy A major extensions of the steel industry would be undertaken to reduce dependence on imports. Under Strategy B, expansion of the industry would be limited to expansion of some complementary fabricating facilities. Priority would be given to raising the efficiency of forging activities in existing small-scale furnaces.

Non-ferrous Metals. This sector at present comprises processing of tin, copper, silver and gold. Important additions will be the Asahan aluminium smelter, and possibly later nickel smelters and an aluminium plant, all largely oriented towards export markets. Strategy A would continue development of this sector involving large capital intensive projects. Strategy B would also include such development on the ground that it involves resource-based exports, but would give it lower priority because of its high capital-intensity.

Engineering Industries. This sector comprises a large variety of activities including the metal-working, electrical machinery, non-electrical machinery and transport equipment and repair branches. In Indonesia, production (chiefly assembly) of consumer durables grew rapidly in the early 1970s and has since then slowed down. Production of capital (producer) goods has risen rapidly in more recent years but has been confined to a narrow range of products, chiefly hand tractors and other agricultural equipment. Strategy A would continue expansion of output of transport equipment (motor vehicles, aircrafts, ships, railway rolling stock) with increasing emphasis on local components. Strategy B would focus on products in which Indonesia is likely to have a comparative advantage. These include electronics and other labour-intensive production of consumer durables, increasingly for export, and production of simple producer goods, largely for processing of primary products, such as estate crops and timber, for the domestic market and for export.

Other Manufacturing. The main sectors in this broad category are the traditional food-processing, textiles and other non-durable consumer goods industries and a range of relatively capital-intensive industries producing non-metal intermediates, such as fertiliser and other chemicals, paper, glass, cement and other building materials and petrochemicals (including refinery products and plastics). Strategy A would continue to expand investment in the latter industries, with the stress on import substitution. Strategy B would emphasise labour-intensive exportable products, such as textiles and garments, some food and tobacco industries (tinned fruit, clove cigarettes), plywood, furniture, leather and rubber products.

Chapter IV. Economic Implications of alternative strategies

4.1 Inter-industry linkages

The economic effects of the establishment of new industries are not always fully apparent from value added, employment and import requirements of the industries themselves, without paying regard also to indirect effects through backward and forward linkages which are revealed by input-output analysis.

Annex Table 37 indicates the forward linkages of the Indonesian manufacturing sector according to recent input-output data[1/]. It shows that around 37 per cent of domestic production of manufactures was destined for intermediate use and of this 60 per cent for sectors other than manufacturing. High forward linkages of individual manufacturing industries include basic agricultural processing industries, wood, textile and building material industries which produce goods used by a few sectors only, as well as chemical and engineering industries which find customers among a wider range of industries.

Backward linkages represent the share of intermediate inputs into a sector provided by domestic suppliers. Estimates of backward linkages can therefore indicate indirect output and employment effects resulting from purchases of inputs by a sector, in addition to the primary direct effects of an increase in output by that sector. Table IV.1 presents estimates of total production effects expressed as a multiple of the direct effects of an increase in domestic production in a sector. It shows that the total effects are between 1.1 and 2.5 times as high as the direct effects.

Forward and backward linkages need to be taken into account in assessing the full ecnomic effects of the establishment or expansion of an industry, but they need to be interpreted with care. An industry with large forward linkages is assured of a domestic market. If its output (or increase in output) replaces imports, additional income and employment are generated,

1/ See Ministry of Industry/NEI: "Structural Analysis of the Indonesian Manufacturing Sector", Rotterdam, February, 1983, which includes a detailed examination of such linkages on the basis of the 1980 input-output table.

Table IV.1: Domestic production effect
(multiple of the direct effects of an
increase in domestic production in a sector)

32	Noodles/Macaroni	2.5394
29	Grain Mill Products	2.4103
26	Coconut Cook. oil	2.3656
37	Other Food Products	2.2186
31	Bakery Products	2.2097
22	Meat Processing	2.2065
48	Tann./Leather Products	2.2065
65	Other Petrol. Products	2.1347
57	Furniture and Fixtures	2.1116
34	Coffee Grinding	2.0340
28	Rice Milling	2.0256
9	Rubber	2.0154
89	Mus. Inst. Sports	1.9938
86	Repair of vehicles	1.9764
27	Other Veget/an. Oil	1.9729
16	Slaughtering	1.9678
82	Ship Build./Repair	1.9674
63	Petroleum Refin./Eng.	1.9513
90	Manufacturing NEC.	1.9227
51	Wood and Cork	1.9114
25	Fish Processing	1.8938
8	Cassava Products	1.8872
7	Handpounded Rice	1.8766
60	Soaps and Cosmetics	1.8664
11	Copra	1.8520
74	Basic Metals	1.8519
13	Processed Tobacco	1.8397
64	Lubric. Grease Oil	1.8356
18	Drying, Salting Fish	1.8219
30	Sugar	1.7946
46	Made-up Textile G.	1.7908
12	Farm Coconut Oil	1.7877
44	Batik	1.7855
49	Leather Products	1.7678
35	Tea Processing	1.7668
39	Soft Drinks	1.7495
23	Dairy Products	1.7215
24	Fruits/Veget. Proc.	1.7001
50	Sawm. and other Proc.	1.6773
17	Sawmilling in Forest	1.6752
75	Metal Products	1.6748
42	Weaving	1.6626
14	Farm Proc. Coffee	1.6534
67	Other Rubber Proc.	1.6392
61	Other Chemical Pr.	1.6308
73	Other Building Mat.	1.6285
36	Soya Bean Processing	1.6134
10	Brown Sugar	1.5775
72	Cement	1.5463
76	Metal Furn./Fixtures	1.5429
33	Cocoa. Choc. Sugar	1.5414
56	Basic Chemicals	1.5389

(Table IV.1 continued)

15	Farm Proc. Tea	1.5267
57	Fertilizers	1.5197
71	Structure Clay Prod.	1.5151
53	Pulp and Paper	1.5151
85	Motorcycles, Bicycles	1.5130
80	Elec. App. Nec/Repair	1.5030
88	Profess./Scientific Pro.	1.4993
83	Railroad Equip./Rep.	1.4961
45	Knitting	1.4782
66	Tyres and Tubes	1.4442
70	Glass/Glass Products	1.4436
40	Cigarettes	1.4172
81	Accum./Dry Batteries	1.4143
55	Printing, Publishing	1.3976
54	Paper Products	1.3971
62	Pesticides	1.3908
69	Ceramics, Earthenware	1.3728
41	Spinning	1.3728
77	Structur. Metal Prod.	1.3587
43	Textile Finishing	1.3302
78	Machinery, Repair	1.3273
59	Drugs and Medicines	1.3202
47	Carpets, Rugs, Ropes	1.3177
87	Aircrafts, Repair	1.3147
38	Alcoholic Beverages	1.2980
79	Radio, TV, Appliances	1.2591
58	Paints	1.2304
84	Motor Vehicles	1.1895
68	Plastic Products	1.1594

Source: Ministry of Industry, NEI: "Structural Analysis of the Indonesian Manufacturing Sector", Rotterdam, February 1982.

although, as with all import substitution, there may be offsetting negative repercussions on the country's export industries. Again, if an import-replacing industry is able to supply cheaper products, quality for quality, than the imports it replaces, there will be a gain to the users, in the form of lower production costs in the case of producer goods, or in welfare in the case of consumer goods. The local industry may, for example, be in a better position to meet the special needs and tastes of local users. But the reverse may happen, in which case the users are adversely affected. This would almost certainly be the case, at least in the first instance, where the domestic import-replacing industry requires substantial tariff or other protection.

Backward linkages suggest that a new industry may provide a stimulus to domestic industries on whose products it draws as inputs, whether intermediates or capital goods. It enlarges their domestic market. This stimulus will be greater the larger the proportion of inputs derived from domestic suppliers rather than from imports, in other words the higher the total production effects, as shown in Table IV.1. But it needs to be remembered that these total production effects (the multipliers of the initial increase in output) are inversely proportional to the proportion of the initial increase in output that accrues as value added in the new industry itself (the multiplicand). The total contribution to GDP or employment throughout the economy is no larger, but more of it accrues in other industries or sectors if the backward linkages are large.

One determinant of the total production effect which measures backward linkages is the proportion of a new industry's inputs that is obtained from abroad as imports. Annex Table 39 shows the direct import requirements resulting from intermediate deliveries for individual industries. It appears that the share of intermediate inputs obtained from imports is particularly high for Indonesian engineering industries, and also high for chemicals. Annex Table 40 presents total import requirements for main categories of manufactures, distinguishing between the actual import requirements of currently producing domestic industries and the hypothetical import requirements of domestic industries set up to replace imports of intermediates. It appears that within each group the intermediate import coefficients of currently producing domestic industries are lower than the hypothetical coefficients of import replacing industries. Both findings might be taken to present a case for further import substitution, so as to increase backward linkages (total production effects). But this is clearly an illegitimate inference. The mere fact that indirect production effects would be larger would not increase overall national gains in GDP or employment. Whether import substitution would be desirable would still need to be assessed, as always, in terms of the current and prospective capacity of the new domestic industry to produce efficiently.

4.2 Factor intensities

If employment generation is an important national objective, one criterion in determining priorities in industrial policy is the factor intensity of an industry. The more labour-intensive an industry, the larger is the effect on employment of an extra unit of production. Here again, inter-industry relationships are important. The indirect employment effects, via forward and backward linkages, may be high, even though the industry itself is relatively capital-intensive.

In the absence of comprehensive and reliable capital stock data for Indonesian manufacturing industries, Table IV.2 uses labour-output ratios to measure labour intensity of production. It also uses skilled man-years per unit of output and non-wage value added per worker as proxies for the use of human and physical capital[1/].

The table presents total as well as direct labour requirements (man-years per Rp. billion of final demand) of manufacturing industries in 1980 and ranks them according to their total labour requirements. It also shows for each industry its ranking in terms of skilled man-years and non-wage value added per worker.

A striking finding is the evidence of very high total labour requirement of many industries, especially resource-based industries, with relatively low direct labour requirements. Among these are food processing industries, such as rice and other grain milling, coconut and other cooking oil processing, but also rubber and leather processing. By contrast, some relatively labour-intensive industries in terms of the labour-output ratio of the industry itself, have relatively small additional indirect effects on employment, among them structural clay products, wood and cork, ceramics, copra and furniture industries. Relatively small indirect employment effects are found also for some more (directly) capital-intensive industries, such as metal furniture and other metal products, knitting and scientific instruments industries, and of course the highly capital intensive industries at the bottom of the list.

1/ Ministry of Industry/NEI, op.cit.

Table IV.2: Total and direct labour requirements in man-years by industry per Rp. billion of domestic final demand and rankings according to labour, skill and non-wage value added

	Labour requirements		Rankings		
	Total	Direct	Labour	Skill	Non-wage value added
Handpounded rice	2914.1	1300.0	1	81	80
Grain mill products	2460.1	210.0	2	61	64
Rice milling	2220.5	435.0	3	79	77
Noodles/macaroni	2146.4	687.0	4	62	59
Struct. clay products	2143.1	1900.0	5	67	72
Other food products	1878.2	810.0	6	51	58
Cassava products	1856.5	430.0	7	78	78
Bakery products	1601.9	711.0	8	30	50
Copra	1589.0	1000.0	9	71	71
Soya bean processing	1573.2	890.0	10	76	79
Wood and cork	1570.0	1240.0	11	33	39
Ceramics, earthenware	1538.8	1410.0	12	39	69
Furniture, fixtures	1351.6	910.0	13	2	35
Drying, salting fish	1208.1	630.0	14	70	65
Processed tobacco	1198.7	650.0	15	77	70
Fish processing	1189.8	563.0	16	68	53
Brown sugar	1144.4	750.0	17	64	68
Coffee grinding	1126.7	516.0	18	63	61
Made-up textile g.	1078.0	750.0	19	54	76
Farm coconut oil	1028.5	480.0	20	74	62
Batik	1025.8	752.0	21	59	57
Coconut cook oil	1018.1	79.0	22	65	26
Slaughtering	988.5	200.0	23	66	66
Tea processing	959.3	473.0	24	69	55
Manufacturing nec.	951.7	643.0	25	50	16
Farm processing coffe	917.8	473.0	26	73	60
Other veget./an. oil	914.7	72.0	27	20	24
Fruits/vegetable processing	849.5	220.0	28	29	54
Farm processing tea	841.6	473.0	29	76	73
Mus. inst., sports pr.	809.7	460.0	30	14	10
Metal furniture/fixtures	754.5	589.0	31	56	25
Other building material	750.5	475.0	32	44	46
Meat processing	746.4	135.0	33	65	30
Leather products	731.6	480.0	34	16	48
Tanneries/leather processing	700.9	100.0	35	55	38
Sugar	691.3	231.0	36	8	32
Metal products	680.3	470.0	37	21	15
Soft drinks	678.8	374.0	38	6	34
Knitting	659.1	508.0	39	52	75
Rubber	655.6	56.0	40	60	19
Prof./scient. pr.	629.0	453.0	41	37	42
Cocoa. choc. sugar	628.6	277.0	42	24	67

(Table IV.2 continued)

	Labour requirements		Rankings		
	Total	Direct	Labour	Skill	Non-wage value added
Weaving	588.6	403.0	43	26	63
Other rubber products	587.4	350.0	44	43	47
ship building/repair	523.0	255.0	45	1	9
sawmilling and other proc.	512.4	250.0	46	23	36
Sawmilling in forest	497.6	250.0	47	27	28
Printing, publishing	468.2	300.0	48	13	49
Repair of vehicles	466.5	286.0	49	3	7
Carpets, rugs, ropes	465.9	281.0	50	75	75
Soaps and cosmetics	440.4	81.0	51	11	27
Plastic products	414.9	335.0	52	53	81
Elec. app. nec., repair	414.4	250.0	53	7	31
Dairy products	373.0	115.0	54	40	21
Cigarettes	371.5	102.0	55	72	43
Glass, glass products	344.2	188.2	56	4	41
Paper products	337.3	160.0	57	38	45
Spinning	335.1	155.0	58	46	56
Plup and paper	330.4	114.0	59	31	33
Other chemical products	311.9	142.0	60	47	13
Machinery, repair	295.0	135.0	61	18	44
Drugs and medicines	291.3	139.0	62	28	51
Basic chemicals	284.6	145.0	63	12	14
Accum./dry batteries	283.0	141.0	64	5	29
Tyres and tubes	266.6	116.0	65	9	22
Cement	252.9	117.0	66	34	8
Textiles finishing	252.0	137.0	67	57	52
Paints	229.5	138.0	68	49	37
Pesticides	213.2	26.0	69	36	6
Structur. metal products	204.5	85.0	70	42	18
Motorcycles, bicycles	203.4	56.0	71	58	17
Alcoholic beverages	194.2	87.0	72	10	20
Railroad equip./rep.	182.8	64.0	73	15	11
Radio, tv, appliances	174.6	76.0	74	32	40
Basic metals	167.6	37.0	75	48	4
Aircraft, repair	147.3	64.0	76	19	23
Fertilizers	135.4	26.0	77	31	5
Motor vehicles	127.4	64.0	78	25	12
Other petroleum products	109.1	26.0	79	17	3
Lubric., grease oil	92.4	26.0	80	35	2
Petroleum ref./LNG	74.3	26.0	81	41	1

Source: Ministry of Industry/NEL, "Structural Analysis of the Indonesian Manufacturing Sector", Rotterdam, February, 1983.

Generally, labour-intensive industries tend to be characterized by a relatively low level of non-wage value added and vice versa. In addition, labour-intensive industries appear to require low levels of skills and vice versa. However, the extent of negative correlation between labour and skill requirements is much lower than between labour and non-wage value added. A number of industries which are ranked in the middle ranges according to labour-intensity appear to be relatively highly ranked according to skill-intensity, such as, shipbuilding, repair of vehicles, glass and glass products, soft drinks, electrical appliances N.E.C. and printing and publishing.

Labour-intensity not only varies between industries, it also varies within industries between sizes of establishments. Generally, labour-intensity tends to decrease with the size of establishments. On the other hand, from data generated by a study on capacity utilization in manufacturing industry, it can be inferred that there is no significant correlation between labour-intensity and the efficiency of capital[1/]. This was found by correlating data on capital per worker and value added per unit of capital. In other words, more capital-intensive industries do not necessarily generate more or less value added per unit of capital.

For the purpose of the present study it is particularly interesting to discuss relative factor intensities in engineering industries. In the underlying input-output exercises 72 manufacturing sectors have been distinguished. Designating sectors attaining rank 1 till 18 with respect to a certain factor as highly factor intensive (++), for ranks 19 till 36 as factor intensive (+), for ranks 37 till 54 as intermediate factor intensive (+,-), and for ranks 55 till 72 as factor extensive (-), the following scheme can be formulated.

1/ Ministry of Industry/NEI: "Project Mankap DTA-193: Harmonization report", Jakarta/Rotterdam, 1983.

ISIC	Sector	Labour	Skill	Capital (Non Wage Value Added)
37100/200	Basic metals	-	+,-	++
38111/2/3/4/40/90	Metal products	+,-	+	++
38120	Metal furn./fixture	+	+,-	+
38130	Struct. metal products	-	+,-	++
38200/330	Machinery, repair	-	++	+,-
38320	Radio,T.V., appliances	-	+	+,-
38340	Elect. app. nec., repair	+,-	++	+
38311/2	Accum./dry batteries	-	++	+
38411	Ship build./repair	+,-	++	++
n.a.[a/]	Railroad equipment/repair	-	++	++
38430	Motor vehicles	-	+	++
38440/50	Motor cycles/bicycles	-	+	++
n.a.[a/]	Repair of vehicles	+,-	++	++
n.a.[a/]	Aircraft, repair	-	+	+
38500	Profess./scient. products	+,-	+,-	+,-

a/ n.a. = no ISIC classification available.

With the exception of metal furniture and fixtures, all metal industries can be classified according to the criterion stated as low to intermediate labour-intensive. The skill indicator used suggests that most metal industries are skill-intensive. Exceptions are basic metals, metal furniture and fixtures, structural metal products and professional and scientific equipment. The non-wage value added indicator of capital intensity points to the prevailing capital-intensive character of metal industries. Only machinery and repair, radio, T.V. and appliances and professional and scientific equipment can be classified as intermediate capital-intensive. These results should be treated with due caution. Apart from the theoretical problems of adding quantities of heterogenous products, the indicators of skill- and capital-intensity are far from perfect. The results can at best provide preliminary indications of less efficient sectors when the general level of skills and/or the availability of investment capital are serious constraints to the ongoing development process.

4.3 Comparison of strategies

The two strategies (A) and (B), discussed is subsections 3.5 and 3.6, have been assessed in terms of their direct implications for employment, investment needs, import requirements and value added. These effects have been presented in Annex Tables 41 and 42. The results are summarized below in Table IV.3.

Table IV.3: Economic effects of alternative strategies

Summary results	Increments 1980-1990	
	Strategy A	Strategy B
Production (Rp. billion)	22,191	22,191
Employment (thousands of persons)	1,785	2,531
Investment (Rp. billion)	32,688	22,462
Value added (Rp. billion)	6,670	6,535
Imports of inputs (Rp. billion)	7,878	6,903
Incremental ratios:		
Capital-output	1.5	1.0
Capital-value added	4.9	3.4
Efficiency of capital (value added-capital)	0.20	0.29
Capital-labour (Rp. million)	18.3	8.9
Value added-labour (Rp. million)	3.7	2.6

Employment. It can easily be observed that strategy (B) has the most favourable effects on employment. It will create some 750,000 jobs or 50 per cent more than strategy (A). It should be noted that the same labour-intensities have been applied for the two strategies. This assumption may lead to somewhat biased results favouring strategy (A), since in many sectors, strategy (B) could lead to substantially higher labour-intensities than strategy (A). Examples are textiles, plastics, building materials, metal products and machinery, most notably electrical appliances (electronics).

Investment needs. Strategy (A) is highly capital-intensive, requiring Rp. 10 trillion or 30 per cent more investment funds than strategy (B). From these data it can also be inferred that the original programme of 52 key projects would require a substantial proportion of total investment in the manufacturing sector. Excluding the refinery and petro-chemical complexes the necessary investment funds for this programme add up to Rp. 8.5 trillion or 25 per cent of the funds needed for strategy (A).

Import requirements. The difference in import requirements of inputs between the two strategies is much less substantial. They are about 14 per cent lower for strategy (B) than for strategy (A). It appears that both capital- and labour-intensive strategies involve industries which import a substantial part of their inputs. Imports amount to 31.1 per cent of the value of production in case of strategy (B) and to 35.5 per cent in case of strategy (A).

At this stage it is not possible to assess the complete impact of the two strategies on foreign exchange earnings. Such an assessment requires estimates of the value of output and inputs at border prices. Generally, strategy (A) requires high levels of effective protection of domestic production. As a result the difference between revenue and production cost at domestic prices for these industries would exceed the difference between revenue and costs at border prices and would, therefore, overstate the contribution to foreign exchange. As strategy (B) implies much lower rates of effective protection, value added in domestic prices will reflect more closely the net contribution to foreign exchange.

Value added. The share of value added in production is very similar for both strategies, namely around 30 per cent.

The effects of both strategies can also be summarized on the basis of a number of ratios (see Table IV.3 above). The capital-output and capital-value-added ratios represent the impact of a unit investment on output and value added respectively. It can be seen that strategy (B) requires less capital to produce a given amount of output (value added) than strategy (A), or a given amount of investment according to strategy (B) produces more value added than the same amount of capital invested according to strategy (A).

It follows that the volume of investment needed for strategy (A) to produce an annual rate of growth of manufacturing output and value added of 9 per cent, would result in an annual rate of growth of output and value added of 11.6 per cent if strategy (B) were implemented. The capital-labour ratios clearly show the high capital intensity of strategy (A). Strategy (A) requires more than twice the amount of capital to create a job than strategy (B).

The analysis above focuses on the development patterns of individual industries and their factor intensities. The results can also be generalized for groups of industries. It has been shown elsewhere that the capital-intensity of imports is significantly higher than that of domestic production (see Annex Table 43). In other words, continuation of import substitution strategies increases the capital-intensity of the manufacturing sector. On the other hand, export industries are highly labour-intensive.

It is possible to add other elements to industrialisation strategies. For example, promotion of small-scale industries is often included as a distinct component of an industrialisation strategy. The development of small-scale industries specifically contributes to employment generation, as they are usually significantly more labour-intensive than larger-scale enterprises (see Table II.12). Small-scale industry development can also have other desirable effects such as a wider dispersion of entrepreneurial and managerial skills and indigenisation of technological development in certain sectors. In Indonesia small-scale industries are most prevalent in the food, clothing, furniture, building materials and metal products industries. These industries are also rapidly growing industries in a labour-intensive export-oriented industrialisation strategy. It seems, therefore, that the development of small-scale industries is easiest to fit in with such a strategy. Nevertheless, to some extent promotion of small-scale industries can also be combined with a capital-intensive import substitution strategy. In that case more forceful measures will probably be needed, such as reserving the production of certain goods to small-scale industries. Other measures of small-scale industry development include encouraging sub-contracting arrangements, such as the foster-parent programme and giving priority to small-scale producers in government procurement efforts, as in the current Keppres 14A programme.

An industrialisation strategy for Indonesia can also focus more explicitly on natural-resource based industries. Such resources include agriculture and various mining products. This type of development generally has low import requirements and, whereas these industries often generate little direct employment, their indirect employment effects are substantial (see Table IV.2).

4.4 Combining different strategies

To some extent it is of course possible to mix elements of various industrialization strategies. A more substantial contribution of the manufacturing sector towards employment and foreign exchange earnings will require the promotion of labour-intensive industries and a stronger orientation towards exports. However, certain capital-intensive industries are needed to achieve a balance in the industrial structure, to provide a stronger base for long-term development and technological deepening. The large size of the country may justify the establishment of large scale industries, since in Indonesia the economies of scale required for efficient operation are more likely to be realized. The selection of such industries, however, should be based on sound economic criteria, weighing carefully economic costs and benefits. Other things being equal, such projects are more likely to be justified if they are financed with foreign investment funds which would not otherwise be forthcoming.

Generally, a selective approach to import substitution may also be blended into a labour-intensive strategy. Priority could be given to industries which are relatively labour-intensive, or in which in the longer run Indonesia is likely to develop a comparative advantage. Currently, import substitution possibilities exist mainly for intermediate and capital goods of which still substantial amounts are imported. Important candidates could include simple engineering products. With regards to non-durable consumer goods already 92 per cent of the supply is produced locally.

As capital will remain a scarce factor in the longer term as well, Indonesia's comparative advantage might develop in the long run from labour-intensive industries to skill-intensive industries with relatively low capital-intensities. It has been demonstrated in this study that several industries in the middle ranges of capital-intensity are relatively skill-intensive. Such industries deserve attention in the next 5-10 years. However, in the short run it requires substantial efforts to improve skills and management.

The development of labour-intensive and resource-based industries has important implications for intersectoral and interregional relationships. It encourages specialization on Java in labour-intensive manufacturing, with the other islands supplying raw materials and food for industrial growth in Java. The other islands can also be the site of the primary resource processing industries. Such a development would be consistent with the distribution of regional comparative advantage of abundant labour in Java and natural resource abundancy on the other islands.

STATISTICAL ANNEX

Annex Table 1

Indicators of population, gross domestic product and manufacturing value added, selected developing countries, 1980

(Values in current prices)

Country	Population	GDP	GDP per capita	Share of GDP (percentage based on current prices)				Manufacturing value added (MVA)	MVA per capita	Average real annual growth rate of MVA	
	(Mill.)	Mill.US$	US$	Agriculture	Industry	Manufacture a/	Services and other	Mill.US$	US$	1960-70	1970-80
Asia											
Indonesia	152	70,024	461	26	35	9	39	6,154	41	4.3	12.3
India	695	159,872	230	37	19	18	44	28,512	41	4.8	4.5
Iran	38	81,420	2,142	15	43	19	42	15,632	411	10.0	10.2
Bangladesh	88	12,735	144	54	8	8	38	966	11	3.7	8.8
Pakistan	82	27,961	339	30	18	17	52	4,716	57	9.9	4.8
Thailand	48	32,905	690	26	21	19	53	6,146	129	10.7	11.8
Philippines	46	35,456	695	23	29	26	48	9,069	178	6.6	7.1
Korea, Rep. of	38	59,329	1,562	17	31	29	52	17,394	458	16.8	15.4
Malaysia	14	21,502	1,576	24	30	23	46	4,840	355	10.1	11.4
Sri Lanka	14	4,155	279	39	12	11	49	440	30	7.7	6.0
Hong Kong	5	21,049	4,346	1	29	29	70	6,077	1,255	11.8	6.5
Singapore	2	10,985	4,526	1	29	28	70	3,113	1,283	14.1	10.6
Other regions:											
Brazil	126	237,757	1,881	13	27	27	60	63,203	500	6.4	8.8
Nigeria	77	117,082	1,519	19	32	5	49	6,020	78	8.0	9.9
Mexico	70	168,441	2,407	9	31	25	60	41,488	593	9.5	5.9
Egypt	42	24,030	572	16	34	11	50	2,758	66	5.0	6.4

Source: UNIDO data base; information supplied by the United Nations Statistical Office, with estimates by the UNIDO secretariat.

a/ Manufacturing is part of industry, but is shown separately since it is often the most important part of the industry sector.

GDP by industrial origin (at constant 1975 prices) in Mill. US $ and Annual Rates of Growth 1960-1980

	Agriculture		Min. + Quarr.		Manufacturing		Utilities		Construction		Services		GDP	
	Mill. US $	Annual Rate of Growth	Mill. US $	Annual Rate of Growth	Mill. US $	Annual Rate of Growth	Mill. US $	Annual Rate of Growth	Mill. US $	Annual Rate of Growth	Mill. US $	Annual Rate of Growth	Mill. US $	Annual Rate of Growth
1960	6,699.7	-	2,032.5	-	911.9	-	33.2	-	308.4	-	4,441.7	-	14,427.4	-
1961	6,864.1	2.5	2,076.8	2.2	1,031.7	13.1	36.5	9.9	401.3	30.1	4,921.0	10.8	15,331.2	6.3
1962	6,975.7	1.6	2,155.6	3.8	1,029.2	-0.2	38.9	6.6	332.9	-17.0	4,871.0	-1.0	15,403.3	0.5
1963	6,677.5	-4.3	2,073.4	-3.8	1,003.8	-2.5	44.6	14.7	250.2	-24.9	4,909.7	0.8	14,959.2	-2.9
1964	7,069.1	5.9	2,186.1	5.4	997.0	-0.7	50.9	14.1	251.9	0.7	5,058.3	3.0	15,613.3	4.4
1965	7,072.5	0.9	2,226.4	1.8	981.7	-1.5	50.5	-0.7	284.8	13.0	5,089.7	0.6	15,705.7	0.6
1966	7,479.6	5.8	2,162.5	-2.9	1,010.2	2.9	51.0	0.9	326.2	14.6	5,140.0	1.0	16,169.6	3.0
1967	7,286.3	-2.6	2,323.9	7.5	1,034.1	2.4	65.4	28.2	280.9	-13.9	5,383.6	4.7	16,374.3	1.3
1968	7,708.0	5.8	2,711.8	16.7	1,113.0	7.6	67.6	3.4	335.0	19.3	5,609.1	4.2	17,544.6	7.1
1969	7,728.6	0.3	3,272.0	20.7	1,264.6	13.6	100.6	48.7	442.7	32.1	6,173.1	10.1	18,981.7	8.2
1970	8,136.3	5.3	3,796.5	16.0	1,397.2	10.5	92.4	-8.1	558.5	26.1	6,599.8	6.9	20,580.7	8.4
1971	8,539.8	5.0	4,061.7	7.0	1,595.3	14.2	102.8	11.2	679.0	21.6	7,107.3	7.7	22.085.8	7.3
1972	8,571.8	0.4	4,910.5	20.9	1,814.9	13.8	107.8	4.8	871.2	28.3	8,148.8	14.7	24,425.0	10.6
1973	9,332.1	8.9	6,029.5	22.8	2,083.0	14.8	124.5	15.6	1,023.9	17.5	8,764.0	7.5	27,357.1	12.0
1974	9,690.9	3.8	6,239.8	3.5	2,422.3	16.5	151.7	21.8	1,252.0	22.3	9,612.0	9.7	29,369.5	7.4
1975	9,648.2	-0.4	5,988.4	-4.0	2,708.1	11.8	168.2	10.9	1,420.9	13.5	10,534.4	9.6	30,468.3	3.7
1976	10,068.2	4.4	6,862.8	14.6	2,960.1	9.3	188.4	12.0	1,492.5	5.0	11,115.1	5.5	32,687.3	7.3
1977	10,239.3	1.7	7,743.2	12.8	3,380.6	14.2	200.2	6.3	1,807.8	21.1	12,509.2	12.5	35,880.4	9.8
1978	10,817.3	5.6	7,625.6	-1.5	3,778.0	11.8	218.8	9.3	2,071.3	14.6	13,684.3	9.4	38,195.3	6.5
1979	11,065.7	2.3	7,571.7	-0.7	4,104.6	8.6	265.9	21.5	2,199.4	6.2	14,834.0	8.4	40,041.4	4.8
1980	11,935.9	7.9	7,660.3	1.2	4,476.0	9.0	290.3	9.2	2,436.3	10.8	16,677.1	12.4	43,476.0	8.6

Average Annual Rate of Growth
(Percentage)

	Agriculture	Min. + Quarr.	Manufacturing	Utilities	Construction	Services	GDP
1960-65	1.1	1.8	1.5	8.8	-1.6	2.8	1.7
1965-70	2.8	11.3	7.3	12.8	14.4	5.3	5.6
1970-75	3.5	9.5	14.2	12.7	20.5	9.8	8.2
1975-80	4.3	5.0	10.6	11.5	11.4	9.6	7.4
1960-70	2.0	6.4	4.4	10.8	6.1	4.0	3.6
1970-80	3.9	7.3	12.3	12.1	15.9	9.7	7.8
1960-80	2.9	6.9	8.3	11.5	10.9	6.8	5.7

Source: Unido Date Base, Information supplied by the United Nations Statistical Office, with estimates by the UNIDO Secretariat.

Annex Table 3

Indonesia: Changing share of economic sectors in GDP, 1960-1980

A. Based on constant 1975 prices (million US dollar)

	Agriculture	Mining and quarrying	Manufacture	Utilities	Construction	Services
			- Percentage share -			
1960	46.44	14.09	6.32	0.23	2.14	30.79
1965	45.03	14.18	6.25	0.32	1.81	32.41
1970	39.53	18.45	6.79	0.45	2.71	32.07
1975	31.67	19.65	8.89	0.55	4.66	34.57
1976	30.80	21.00	9.06	0.58	4.57	34.00
1977	28.54	21.58	9.42	0.56	5.04	34.86
1978	28.32	19.96	9.89	0.57	5.42	35.83
1979	27.64	18.91	10.25	0.66	5.49	37.05
1980	27.45	17.62	10.30	0.67	5.60	38.36

B. Based on current prices (million US dollar)

	Agriculture	Mining and quarrying	Manufacture	Utilities	Construction	Services
			- Percentage share -			
1960	53.37	4.08	8.0	0.27	2.08	32.19
1965	58.25	2.73	7.28	0.02	1.90	29.83
1970	48.64	5.34	9.05	0.46	3.09	33.42
1975	31.67	19.65	8.89	0.55	4.66	34.57
1976	31.11	18.94	9.40	0.63	5.25	34.65
1977	31.06	18.93	9.56	0.56	5.38	34.50
1978	29.86	19.40	9.73	0.52	5.53	34.96
1979	28.96	22.50	8.43	0.48	5.77	33.86
1980	25.71	26.67	8.79	0.51	5.77	32.55

Source: UNIDO Data Base, information supplied by the United Nations Statistical Office, with estimates by the UNIDO Secretariat.

INDONESIA

ANNUAL GROWTH RATES OF REAL MANUFACTURING VALUE ADDED,1970-1980
(PERCENTAGES ON THE BASIS OF VALUES IN 1975 US$ CONSTANT PRICES)

ISIC	ISIC-DESCRIPTION	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	##/##
3110	FOOD PRODUCTS	5.8	9.6	0.0	12.9	11.1	48.0	17.6	-0.6	16.2	16.9	14.1
3130	BEVERAGES	26.2	41.5	13.3	11.8	5.3	-6.0	9.6	1.9	12.4	9.3	9.7
3140	TOBACCO	5.0	9.5	11.6	13.0	14.9	4.0	17.3	-0.8	0.0	21.5	9.4
3210	TEXTILES	-4.8	47.5	35.6	12.5	11.1	8.0	-1.9	4.7	4.5	5.2	11.8
3220	WEARING APPAREL,EXCEPT FOOTWEAR	35.8	13.9	11.0	5.5	4.2	...	...	...	...	...	12.6
3230	LEATHER PRODUCTS	87.0	0.0	58.1	41.2	4.2	29.0	...	...	...	...	31.5
3240	FOOTWEAR,EXCEPT RUBBER OR PLASTIC	61.0	12.1	-5.4	21.4	17.6	14.0	0.9	3.5	-5.9	16.1	10.1
3310	WOOD PRODUCTS,EXCEPT FURNITURE	11.0	0.0	-16.0	27.9	14.9	18.0	66.9	10.7	0.9	78.2	17.6
3320	FURNITURE,EXCEPT METAL	6.7	12.5	25.9	41.2	4.2	13.0	...	...	...	...	18.7
3410	PAPER AND PRODUCTS	25.0	30.0	63.5	11.8	5.3	-2.0	9.2	25.2	12.7	1.3	16.1
3420	PRINTING AND PUBLISHING	5.3	12.5	-15.6	142.1	8.7	24.0	...	...	...	...	24.3
3510	INDUSTRIAL CHEMICALS	15.5	7.5	25.0	5.6	5.3	-13.0	64.4	49.0	30.5	33.8	18.9
3520	OTHER CHEMICALS	19.5	-3.3	0.0	5.6	6.4	-2.0	-3.1	9.5	-1.0	19.4	3.2
3530	PETROLEUM REFINERIES	3.0	10.6	17.4	-11.9	-16.0	38.0	35.5	3.7	2.1	3.5	8.0
3550	RUBBER PRODUCTS	0.0	-4.3	13.6	50.0	33.3	37.0	22.6	20.8	11.6	13.2	22.8
3560	PLASTIC PRODUCTS	43.8	43.5	-6.1	90.3	69.5	-28.0	...	...	...	...	33.2
3610	POTTERY,CHINA,EARTHENWARE	7.4	13.7	-18.1	42.6	3.1	29.0	...	...	...	...	10.1
3620	GLASS AND PRODUCTS	7.1	11.1	80.0	5.6	5.3	-6.0	47.9	15.1	6.9	21.6	17.4
3690	OTHER NON-METALLIC MINERAL PRODUCTS	2.6	10.0	13.6	50.0	33.3	25.0	42.4	43.3	23.1	16.9	28.7
3710	IRON AND STEEL	66.7	140.0	30.9	50.0	33.3	37.0	2.9	27.7	146.1	133.4	50.2
3810	FABRICATED METAL PRODUCTS	3.0	17.6	50.0	36.7	22.0	9.0	22.0	15.8	0.0	11.7	20.2
3820	MACHINERY,EXCEPT ELECTRICAL	-3.3	6.9	58.1	69.4	20.5	-8.0	...	...	...	...	27.6
3830	MACHINERY ELECTRIC	11.1	0.0	40.0	78.6	33.3	23.0	40.7	25.4	0.9	43.8	30.8
3840	TRANSPORT EQUIPMENT	11.1	20.0	19.4	8.1	7.5	-9.0	-9.9	15.9	-15.8	55.0	5.6
3850	PROFESSIONAL & SCIENTIFIC EQUIPMENT	16.4	12.9	64.6	-19.0	-21.9	72.0	...	...	...	...	12.0
3900	OTHER MANUFACTURED PRODUCTS	16.4	12.9	64.6	-19.0	-21.9	72.0	...	...	...	...	12.0
3000	TOTAL MANUFACTURING	6.2	12.3	14.5	6.3	4.0	21.9	19.2	8.4	8.2	17.3	11.8

SOURCE: UNIDO DATA BASE;INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE,WITH ESTIMATES BY THE UNIDO SECRETARIAT.

##/ THE INITIAL- AND/OR THE END-YEAR OF THE TREND-GROWTH,IS ALWAYS THE FIRST AND/OR THE LATEST YEAR SHOWN IN THE YEAR-TO-YEAR-GROWTH

NOTE: TOTAL MANUFACTURING IS THE SUM OF THE AVAILABLE COMPONENTS AND DOES NOT NECESSARILY CORRESPOND TO ISIC 300

INDONESIA

STRUCTURAL CHANGES OF VALUE ADDED IN MANUFACTURING, 1971-1980
(SECTORAL SHARES(PERCENTAGES) ON THE BASIS OF VALUES IN NATIONAL CURRENCY AT CURRENT PRICES)

ISIC	ISIC-DESCRIPTION	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
3000	TOTAL MANUFACTURING	100.0 A/	100.0 A/	100.0 A/	100.0 A/	100.0	100.0 A/	100.0 A/	100.0 A/	100.0 A/	100.0 A/
3110	FOOD PRODUCTS	33.9	31.5	24.5	26.7	21.0	16.8	18.0	16.4	18.1	11.1
3130	BEVERAGES	2.0	1.7	1.8	2.5	2.1	2.0	2.0	1.2	1.6	1.5
3140	TOBACCO	27.9	15.4	17.4	16.9	11.5	18.9	15.3	16.3	13.9	19.1
3210	TEXTILES	13.2	15.5	25.6	17.4	12.5	15.1	12.4	12.7	13.8	12.4
3220	WEARING APPAREL,EXCEPT FOOTWEAR	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.4
3230	LEATHER PRODUCTS	0.3	0.3	0.4	0.2	0.2	0.3	0.4	0.2	0.2	0.2
3240	FOOTWEAR,EXCEPT RUBBER OR PLASTIC	0.6	0.0	0.6	0.8	2.1	1.4	1.0	0.7	1.0	0.8
3310	WOOD PRODUCTS,EXCEPT FURNITURE	1.4	3.6	2.7	2.9	2.9	3.5	3.3	4.0	4.4	7.0
3320	FURNITURE,EXCEPT METAL	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2
3410	PAPER AND PRODUCTS	2.0	1.8	2.0	1.1	1.4	1.4	1.8	1.8	1.7	1.5
3420	PRINTING AND PUBLISHING	2.0	1.2	0.7	1.6	1.6	1.6	1.5	1.6	1.7	1.5
3510	INDUSTRIAL CHEMICALS	0.8	1.6	1.8	3.4	5.8	7.2	7.2	7.5	6.3	4.3
3520	OTHER CHEMICALS	3.8	9.2	5.3	4.0	4.3	5.2	6.6	5.6	4.6	7.1
3530	PETROLEUM REFINERIES	...	...	...	...	15.0	...	...	...	...	...
3540	MISC. PETROLEUM AND COAL PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3550	RUBBER PRODUCTS	1.3	1.4	1.3	1.8	1.5	3.4	2.9	5.7	5.4	4.8
3560	PLASTIC PRODUCTS	0.5	0.6	0.4	0.8	0.9	0.7	1.1	1.2	1.1	0.7
3610	POTTERY,CHINA,EARTHENWARE	0.6	0.4	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
3620	GLASS AND PRODUCTS	0.5	0.5	0.7	0.7	0.5	0.6	1.2	2.0	1.6	1.1
3690	OTHER NON-METALLIC MINERAL PRODUCTS	2.5	4.6	2.5	2.9	3.8	5.0	6.7	7.2	6.9	5.9
3710	IRON AND STEEL	...	...	...	0.2	0.2	0.8	1.2	0.5	1.3	3.1
3720	NON-FERROUS METALS	...	...	...	0.6	0.8	...	...	...	...	0.0
3810	FABRICATED METAL PRODUCTS	2.3	3.2	3.6	3.0	3.0	4.0	3.8	2.9	3.2	3.5
3820	MACHINERY,EXCEPT ELECTRICAL	0.4	1.0	1.2	2.3	1.4	1.0	1.2	1.7	2.0	1.6
3830	MACHINERY ELECTRIC	2.5	1.6	2.9	4.0	3.2	4.1	5.2	4.8	4.5	5.3
3840	TRANSPORT EQUIPMENT	0.9	4.0	3.4	5.5	3.5	5.9	6.3	5.0	5.3	6.4
3850	PROFESSIONAL & SCIENTIFIC EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
3900	OTHER MANUFACTURED PRODUCTS	0.3	0.6	0.8	0.4	0.2	0.5	0.3	0.2	0.3	0.4
	TOTAL MANUFACTURING IN MILLIONS	135990	205965	309510	381770	572400	648400	774500	1008330	1290400	2130000

SOURCE: UNIDO DATA BASE,INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE,WITH ESTIMATES BY THE UNIDO SECRETARIAT.

FOOTNOTES:
A/ 3000-3530

Indonesia: Structural change of manufacturing value added according to end use of manufactured products, 1971-1980

(Based on current prices in national currency)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
					- Percentage share -					
Consumer goods[b]	80.8	66.6	72.0	66.8	60.8 (51.7)	56.7	51.1	49.8	51.2	47.6
Intermediate goods[c]	13.1	23.6	17.1	18.4	26.1 (37.2)	28.3	32.3	35.7	33.7	35.5
Capital goods[d] [e]	6.1	9.8	10.9	14.8	13.1 (11.1)	15.0	16.6	14.5	15.1	16.9
Total manufacturing	100	100	100	100	100 (100)[f]	100	100	100	100	100

Source: UNIDO data base; information supplied by the United Nations Statistical Office, with estimates by the UNIDO secretariat (see Annex Table 5).

Footnotes:

a/ ISIC 3000 - 3530.
b/ ISIC 3110, 3130, 3140, 3210, 3220, 3240, 3320, 3420, 3610, 3900.
c/ ISIC 3230, 3310, 3410, 3510, 3520, 3530, 3540, 3550, 3560, 3620, 3690, 3710, 3720.
d/ ISIC 3810, 3820, 3830, 3840, 3850.
e/ Includes also some consumer durables.
f/ ISIC 3000.

Annex Table 7

Indonesia: Production of selected commodities, 1970, 1975-1980.

	1970	1975	1976	1977	1978	1979	1980
Mainly consumer goods:							
Cement (tons)	514,993	1,077,179	1,809,656	2,548,545	3,648,875	4,431,530	5,259,380
Paper (tons)	11,693	45,905	49,744	53,770	69,606	74,355	78,214
Yarn (bales)	184,632	128,781	136,078	135,746	166,040	140,975	147,085
Beer (1,000 liters)	18,899[b/]	49,861	46,991	51,284	52,187	53,842	64,403
Cigarettes (million pieces)	9,694	16,194	16,840	16,910	18,899	21,425	22,429
Capital goods (ISIC 382,383,384) (Number of units):							
Engines diesel (382104)	...	8,000	24,000	25,300	30,400	25,000	34,100
Concrete mixers for use at construction site (382434)	35	...	...	...	...	...	...
Sewing machines (382910)	5,000	520,000	400,000	485,000	600,000	480,000	525,000
Air conditioning machines (382925)	...	8,000	24,000	23,000	8,000	36,000	...
Pumps for liquids, excl. liquid elevators (382942)	3,000	...	...	...	...	...	...
Tankers, launched (384113)	-	3	-	-	4	-	-
Other sea-going merchant vessels, launched (384116)	1	6	10	2	7	3	3
Buses, etc., assembled from imported parts (384312)	...	...	44,398	69,379	65,196	61,015	...
Iron and steel (ISIC 371) (Metric tons):							
Crude steel for castings (371016)[a/]	...	100,000	139,000	250,000	225,000	305,000	360,000
Chemicals (ISIC 351, 352) (Metric tons):							
Methanol (Methyl alchohol) (351121)	8,754	...	...	...	...	...	...
Butyl alchohol (351122)	6,151	...	...	...	...	...	...
Clycerine (Glycerol) (351125)	3,188	...	...	...	...	...	...
Hydrochloril acid (351146)	780	3,962	3,804	1,260	1,684	3,986	...
Sulphuric acid(351147)	...	16,000	8,000	17,000	16,000	11,000	...
Ammonia (351158)	2,000	...	...	8,000	9,000	7,000	...
Caustic soda (351159)	2,000	-	-	-	-	-	...

	1970	1975	1976	1977	1978	1979	1980
(cont'd)							
Aluminum sulphate (351163)	...	16,170	13,570	11,292	13,206	6,409	...
Nitrogenous fertilizers (351201)	39,000	121,000	208,000	184,000	396,000	694,000	875,000
Super phosphates (351204)	-	-	-	-	-	-	53,000
Phosphatic fertilizers, other (351207)	-	-	-	-	-	-	1,000
Multinutrient fertilizers N content (351213)	-	-	-	-	-	-	1,000
Multinutrient fertilizers P 205 content (35121)	-	-	-	-	-	-	1,000
Insecticides, fungicides, etc. (351216)	20,164	...	...	...	...	...	...
Non-cellulosic staple and tow (351304)	...	4,200	2,500	37,200	45,400	50,300	53,900
Non-cellulosic continous fibres (351337)	...	3,600	11,000	17,300	21,300	22,700	41,500
Paints, cellulose (352101)	...	...	...	...	818	9,233	...
Paints, water (352104)	...	...	...	...	197	50	...
Paints, other (352107)	7,525	...	...	...	15,544	8,118	...
Soap (352301)	43,913	46,182	45,046	47,915	50,196	55,531	...
Washing powder and detergents (352304)	2,621	33,636	33,613	37,101	38,481	43,036	43,000
Carbon black (352901)	-	3,200	1,715	974	...	...	...
Printers ink (352904)	22	762	822	1,256	1,887	2,670	...
Petrochemicals (ISIC 353, 354, 356) (Metric tons):							
Aviation gasolene (353001)	20,000	21,000	15,000	13,000	16,000	15,000	18,000
Jet fuels (353004)	118,000	118,000	108,000	94,000	130,000	185,000	241,000
Motor gasolene (353007)	1,421,000	1,854,000	1,531,000	1,858,000	2,082,000	2,318,000	2,812,000
Naphthas (353010)	-	392,000	371,000	914,000	900,000	870,000	850,000
Kerosene (353013)	1,914,000	3,200,000	2,925,000	3,902,000	3,863,000	4,482,000	4,396,000
White spirit (353016)	10,000	24,000	21,000	25,000	20,000	20,000	23,000
Distillate fuel oils (353019)	1,248,000	2,891,000	2,703,000	3,793,000	4,385,000	4,578,000	4,719,000
Residual fuel oils (353022)	5,538,000	6,643,000	7,662,000	9,469,000	9,742,000	11,101,000	11,336,000
Lubricating oils (353025)	2,000	4,000	2,000	3,000	4,000	5,000	4,000
Paraffin wax (353028)	66,000	36,000	34,000	42,000	38,000	43,000	38,000
Petroleum coke (353031)	40,000	36,000	28,000	34,000	35,000	30,000	34,000
Bitumen (asphalt) (353034)	49,000	54,000	47,000	83,000	80,000	85,000	80,000
Liquefied petroleum gas from natural gas plant (3530371)	3,000	1,000	1,000	2,000	3,000	3,000	2,000
Liquefied petroleum gas from petroleum refineries (3530372)	13,000	29,000	25,000	26,000	25,000	30,000	35,000

Source: UNIDO Asian Industry in Figures: A Statistical Profile of Key Sectors in Selected ESCAP Countries, UNIDO/IS.390, 15 June 1983.

Footnotes: a/ Including crude steel, ignots (ISIC 371019)
b/ 1971.
- In general, three dots (...) indicate that data are not available, or are not separately reported.
- A dash (-) indicates that the amount is nil or negligible.

Indonesia: Indicators of Apparent Consumption of Selected Manufactures 1970-72 and 1976-78

Product (ISIC; unit of measurement)	Average annual per capita apparent consumption		Production (As a percentage of apparent consumption)		Imports (As a percentage of apparent consumption)		Per capita apparent consumption as a ratio to the OECD average (weighted)	
	1970-1972	1976-1978	1970-1972	1976-1978	1970-1972	1976-1978	1970-1972	1976-1978
Food products (311)								
Beef and veal, fresh (101;kg) a/	1.3	1.3	100.0	99.5	0.0	0.5	0.042	0.038
Milk and cream, condensed (201;g) a/b/	325.0	381.0	97.8	96.6	2.1	3.4	0.084	0.120
Milk and cream, dried (204;g) a/b/	236.0	338.0	18.3	20.9	81.7	79.1	0.059	0.073
Butter (207;g) b/	...	50.0	...	4.1	...	95.9	...	0.013
Vegetables, tinned or bottled (322;g) a/b/	8.0	9.0	20.4	22.8	79.6	101.9	0.001	0.000
Fish, tinned (407;g) a/b/	49.0	164.0	44.9	20.3	53.8	80.2	0.029	0.095
Flour, wheat (601;kg) a/b/	1.8	5.3	67.5	99.6	32.5	0.4	0.030	0.092
Flour, cereal, other than wheat (607;kg) b/	...	0.4	...	98.8	...	1.2	...	0.070
Bread, ships' biscuits, etc. (704;kg) b/	...	0.1	...	99.4	...	0.4	...	0.004
Raw sugar (801;kg) a/	6.9	7.7	100.0	99.6	0.0	0.4	0.173	0.179
Refined sugar (804;kg) a/b/	7.2	9.3	91.4	84.1	8.6	15.9	0.179	0.227
Prepared animal feeds (312201;kg) b/	...	1.6	...	99.7	...	0.3	...	0.008
Vegetable oils (311)								
Oil, soya bean (510 and 513;kg) c/a/	0.1	...	100.0	...	0.0	...	0.007	...
Oil, ground nut (522 and 525;kg) c/a/d/	0.2	0.2	100.0	106.6	0.0	0.0	0.118	0.167
Oils, other, of vegetable origin (534 and 537;kg) b/	...	1.5	...	303.0	...	3.4	...	0.185
Textiles (321)								
Wool pured and mixed (103;g)	...	-	...	0.0	...	100.0	...	0.000
Cotton yarn, pured and mixed (109:g) a/b/	478.0	528.0	58.7	98.9	41.3	1.1	0.109	0.122
Cotton woven fabrics (128;g) c/a/d/	380.0	722.0	92.8	99.8	7.2	0.2	0.117	0.235
Pulp and paper (341)								
Wood pulp, mechanical (101; kg) e/f/	-	...	100.0	...	0.0	...	0.000	...
Pulp of fibres other than wood (104; kg) a/	0.2	0.3	90.7	91.7	9.3	8.3	0.095	0.167
Newsprint (119;kg) a/	0.3	0.5	7.1	2.3	92.9	97.7	0.012	0.019
Other printing and writing paper (122;kg) a/	0.3	0.6	15.4	63.3	84.6	36.7	0.009	0.015
Industrial chemicals (351)								
Methanol (methyl alcohol) (121;g)	73.0	...	100.0	...	0.0	...	0.009	...
Sulphuric acid (147;kg)	...	0.1	...	89.9	...	10.1	...	0.001
Nitric acid (149;kg) a/	-	-	0.0	0.0	100.0	100.0	0.000	0.000
Ammonia (158;kg) a/g/	-	-	90.8	96.0	9.2	4.0	0.000	0.000
Caustic soda (159;kg) e/f/	0.2	...	8.8	...	91.2	...	0.007	...
Calcium carbide (173;kg) a/	0.1	0.1	0.0	0.0	100.0	100.0	0.015	0.032
Dyestuffs, synthetic (174;g) a/	56.0	60.0	0.0	0.0	100.0	100.0	0.104	0.109
Nitrogenous fertilizers (201;kg) a/	3.6	0.8	10.4	238.4	89.6	32.6	0.164	0.029
Phosphatic fertilizers (204 and 207;kg) b/	0.3	0.3	0.0	0.0	100.0	100.0	0.022	0.022
Potassic fertilizers (210;kg) b/	0.1	0.2	0.0	0.0	100.0	100.0	0.005	0.010
Insecticides, fungic., disinfect., etc. (216;g) a/	90.0	...	23.7	...	76.3	...	0.043	...
Rubber, synthetic (301;kg)	...	65.0	...	0.0	...	100.0	...	0.008
Petroleum refineries (353)								
Distillate fuel oils (019;kg) a/	13.0	24.9	90.2	93.4	9.8	10.5	0.023	0.040
Residual fuel oils (022;kg)	27.4	59.5	188.8	112.6	0.0	6.1	0.048	0.112
Iron and steel (371)								
Wire rods (028;kg)	...	0.9	...	0.0	...	100.0	...	0.029
Angles, shapes, sections, 80 mm or more (036;kg)	...	0.1	...	0.0	...	100.0	...	0.004
Angles, shapes, sections, under 80 mm (037;kg)	...	0.1	...	0.0	...	100.0	...	0.002
Plates (heavy), over 4.75 mm (040;kg) f/	0.2	0.5	0.0	0.0	100.0	100.0	0.005	0.012
Plates (medium), 3 to 4.5 mm (043;kg) f/	-	0.2	0.0	0.0	100.0	100.0	0.000	0.017
Tubes, seamless (076;kg) a/	0.6	0.5	0.0	0.0	100.0	100.0	0.052	0.045
Tubes, welded (079;kg) f/	0.3	-	0.0	0.0	100.0	100.0	0.012	0.000
Steel castings in the rough state (085;kg) f/	-	-	0.0	0.0	100.0	100.0	0.000	0.000
Steel forgings (088;kg) f/	-	-	0.0	0.0	100.0	100.0	0.000	0.000
Non-ferrous metals (372)								
Copper, refined, unwrought (004;g) e/ f/ b/	-	1.0	0.0	0.0	100.0	100.0	0.000	0.000
Aluminum, unwrought (022;g) a/	1.0	76.0	0.0	0.0	100.0	100.0	0.000	0.004
Lead, refined, unwrought (037;g) a/	5.0	34.0	0.0	0.0	100.0	100.0	0.001	0.007
Zinc, unwrought (043;g) a/	233.0	257.0	0.0	0.0	100.0	100.0	0.042	0.051
Tin, unwrought (049;g) a/	21.0	62.0	398.2	279.8	3.4	0.1	0.089	0.257

Source: UNIDO Handbook of Industrial Statistics, ID/284; E.82.IIB.2;1982.

a/ For first period: 1971 and 1972.
b/ For second period: 1976 and 1977.
c/ Estimates.
d/ For second period/ 1976 only.
e/ Trade data for 1970 refer only to trade with OECD countries.
f/ For first period: 1970 only.
g/ For second period: 1977 only.

Relative degree of industrialization in the 1970s by industrial branch

ISIC	Description	All countries	Developing countries	Comparable country group a/
311,2	Food products	1.03	1.24	1.30
313	Beverages	0.48	0.52	0.87
314	Tobacco	1.60	1.38	1.73
321	Textiles	0.44	0.36	0.63
322	Wearing apparel	0.05	0.07	0.10
323	Leather and fur products	0.29	0.31	0.49
324	Footwear	0.73	0.82	0.96
331	Wood and cork products	1.02	1.16	1.21
332	Furniture and fixtures excluding metal(332)	0.35	0.41	0.41
341	Paper	0.68	0.68	0.74
342	Printing and publishing (342)	0.77	0.83	0.73
351	Industrial chemicals	1.29	1.30	1.34
352	Other chemicals	0.73	0.67	0.76
353	Petroleum refineries	7.77	9.25	10.92
354	Miscellaneous products of petroleum and coal	...	...	...
355	Rubber products	1.75	1.26	1.46
356	Plastic products	0.86	0.89	0.90
361	Pottery, china and earthenware	0.35	0.28	0.35
362	Glass	0.50	0.37	0.54
369	Other non-metallic mineral products	1.26	1.29	1.82
371	Iron and steel	0.07	0.04	0.07
372	Non-ferrous metals	...	...	...
381	Metal products, excluding machinery	0.63	0.61	0.65
382	Non-electrical machinery	0.90	0.72	0.92
383	Electric machinery	1.13	1.03	0.97
384	Transport equipment	1.49	1.38	1.79
385	Professional and scientific equipment, photographic and optical goods	0.60	0.56	0.68
390	Other manufactures	0.27	0.23	0.18
300	Total manufacturing	0.46	0.48	0.65

Source: UNIDO: Handbook of Industrial Statistics, ID/284, E.82.II.B.2, 1982.

a/ Large countries.

Indicators of Net Manufacturing Output. 1970 and 1977

Branch (ISIC)	Relative Specialization in Manufacturing Output a/	
	1970	1977
Food products (311/2)	2.21	1.48
Beverages (313)	0.52	0.60
Tobacco (314)	9.15	9.63
Textiles (321)	1.55	1.91
Wearing apparel (322)	0.01	0.03 b/
Leather and fur products (323)	0.16	0.40 b/
Footwear (324)	0.37	1.10
Wood and cork products (331)	1.11	1.37
Furniture and fixtures excluding metal (332)	0.10	0.15
Paper (341)	0.16	0.25
Printing and publishing (342)	0.18	0.44
Industrial chemicals (351)	0.52	0.94
Other chemicals (352)	1.27	0.58
Petroleum refineries (353)	17.20	14.37
Miscellaneous products of petroleum and coal (354)	....	....
Rubber products (355)	1.32	0.61
Plastic products (356)	0.12	0.31
Pottery, china and earthenware (361)	0.28	0.37 b/
Glass (362)	0.24	0.57 b/
Other non-metallic mineral products (369)	0.99	2.20
Iron and steel (371)	0.03 b/	0.04 b/
Non-ferrous metals (372)	....	....
Metal products, excluding machinery (381)	0.19	0.43 b/
Non-electrical machinery (382)	0.05	0.14 b/
Electrical machinery (383)	0.17	0.27
Transport equipment (384)	0.15	0.38
Professional and scientific equipment, photographic and optical goods (385)	0.02	0.02 b/

Source: UNIDO Handbook of Industrial Statistics, ID/284; E.82.II.B.2, 1982.

a/ Relative to all large countries.
b/ Estimated.

INDONESIA

NUMBER OF ESTABLISHMENTS, EMPLOYMENT, WAGES AND SALARIES
MONEY VALUES IN NATIONAL CURRENCY (AT CURRENT PRICES)

ISIC	ISIC-DESCRIPTION	NUMBER OF ESTABLISHMENTS ESTABLISHM. 1970	NUMBER OF ESTABLISHMENTS ESTABLISHM. 1980	EMPLOYMENT EMPLOYEES 1970	EMPLOYMENT EMPLOYEES 1980	WAGES AND SALARIES (MILLIONS) 1970	WAGES AND SALARIES (MILLIONS) 1980
3000	TOTAL MANUFACTURING	5049 A/	8054 A/	486650 A/	963000 A/	25045 A/	448792 A/
3110	FOOD PRODUCTS	1045	1674	92000	153500	7450	71370
3130	BEVERAGES	50	100	3900	7200	330	8321
3140	TOBACCO	870	715	132000	158700	3730	33563
3210	TEXTILES	1640	1957	142500	229900	5710	77249
3220	WEARING APPAREL, EXCEPT FOOTWEAR	80	134	3000	15500	35	4881
3230	LEATHER PRODUCTS	28	40	1600	3100	80	1137
3240	FOOTWEAR, EXCEPT RUBBER OR PLASTIC	23	57	3300	7500	250	3294
3310	WOOD PRODUCTS, EXCEPT FURNITURE	107	483	7000	58900	360	31220
3320	FURNITURE, EXCEPT METAL	43	137	1700	5700	90	2370
3410	PAPER AND PRODUCTS	40	84	4450	11900	245	7467
3420	PRINTING AND PUBLISHING	196	279	12200	19900	695	12149
3510	INDUSTRIAL CHEMICALS	43	97	5000	13900	440	17067
3520	OTHER CHEMICALS	187	297	20250	40800	1570	34080
3530	PETROLEUM REFINERIES	...	...	...	...	...	...
3540	MISC. PETROLEUM AND COAL PRODUCTS	0	0	0	0	0	0
3550	RUBBER PRODUCTS	56	222	5650	36900	750	20588
3560	PLASTIC PRODUCTS	80	221	5500	17700	270	6043
3610	POTTERY, CHINA, EARTHENWARE	6	21	600	6800	70	2530
3620	GLASS AND PRODUCTS	26	49	3150	8900	140	5668
3690	OTHER NON-METALLIC MINERAL PRODUCTS	205	570	8750	30700	880	17342
3710	IRON AND STEEL	...	23	...	8800	...	8932
3720	NON-FERROUS METALS	...	0	...	0	...	0
3810	FABRICATED METAL PRODUCTS	150	363	13700	40800	870	21297
3820	MACHINERY, EXCEPT ELECTRICAL	47	132	4400	11900	280	8101
3830	MACHINERY ELECTRIC	19	113	3400	37400	200	24318
3840	TRANSPORT EQUIPMENT	39	178	6450	29900	420	27475
3850	PROFESSIONAL & SCIENTIFIC EQUIPMENT	0	25	0	1000	0	368
3900	OTHER MANUFACTURED PRODUCTS	69	83	6150	5700	180	1962

SOURCE: UNIDO DATA BASE, INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE, WITH ESTIMATES BY THE UNIDO SECRETARIAT.

FOOTNOTES:
A/ 3000-3530

(Annex Table 11 continued)

INDONESIA

NUMBER OF ESTABLISHMENTS,EMPLOYMENT,WAGES AND SALARIES
BRANCH SHARES(IN PERCENT) IN TOTAL MANUFACTURING

ISIC	ISIC-DESCRIPTION	NUMBER OF ESTABLISHMENTS ESTABLISHM. (PERCENT) 1970	NUMBER OF ESTABLISHMENTS ESTABLISHM. (PERCENT) 1980	EMPLOYMENT EMPLOYEES (PERCENT) 1970	EMPLOYMENT EMPLOYEES (PERCENT) 1980	WAGES AND SALARIES (PERCENT) 1970	WAGES AND SALARIES (PERCENT) 1980
3000	TOTAL MANUFACTURING	100.00 A/	100.00 A/	100.00 A/	100.00 A/	100.00 A/	100.00 A/
3110	FOOD PRODUCTS	20.70	20.78	18.90	15.94	29.75	15.90
3130	BEVERAGES	0.99	1.24	0.80	0.75	1.32	1.85
3140	TOBACCO	17.23	8.88	27.12	16.48	14.89	7.48
3210	TEXTILES	32.48	24.30	29.28	23.87	22.80	17.21
3220	WEARING APPAREL,EXCEPT FOOTWEAR	1.58	1.66	0.62	1.61	0.14	1.09
3230	LEATHER PRODUCTS	0.55	0.50	0.33	0.32	0.32	0.25
3240	FOOTWEAR,EXCEPT RUBBER OR PLASTIC	0.46	0.71	0.68	0.78	1.00	0.73
3310	WOOD PRODUCTS,EXCEPT FURNITURE	2.12	6.00	1.44	6.12	1.44	6.96
3320	FURNITURE,EXCEPT METAL	0.85	1.70	0.35	0.59	0.36	0.53
3410	PAPER AND PRODUCTS	0.79	1.04	0.91	1.24	0.98	1.66
3420	PRINTING AND PUBLISHING	3.88	3.46	2.51	2.07	2.78	2.71
3510	INDUSTRIAL CHEMICALS	0.85	1.20	1.03	1.44	1.76	3.80
3520	OTHER CHEMICALS	3.70	3.69	4.16	4.24	6.27	7.59
3530	PETROLEUM REFINERIES	...	...	...	...	...	...
3540	MISC. PETROLEUM AND COAL PRODUCTS	0.00	0.00	0.00	0.00	0.00	0.00
3550	RUBBER PRODUCTS	1.11	2.76	1.16	3.83	2.99	4.59
3560	PLASTIC PRODUCTS	1.58	2.74	1.13	1.84	1.08	1.35
3610	POTTERY,CHINA,EARTHENWARE	0.12	0.26	0.12	0.71	0.28	0.56
3620	GLASS AND PRODUCTS	0.51	0.61	0.65	0.92	0.56	1.26
3690	OTHER NON-METALLIC MINERAL PRODUCTS	4.06	7.08	1.80	3.19	3.51	3.86
3710	IRON AND STEEL	...	0.29	...	0.91	...	1.99
3720	NON-FERROUS METALS	...	0.00	...	0.00	...	0.00
3810	FABRICATED METAL PRODUCTS	2.97	4.51	2.82	4.24	3.47	4.75
3820	MACHINERY,EXCEPT ELECTRICAL	0.93	1.64	0.90	1.24	1.12	1.81
3830	MACHINERY ELECTRIC	0.38	1.40	0.70	3.88	0.80	5.42
3840	TRANSPORT EQUIPMENT	0.77	2.21	1.33	3.10	1.68	6.12
3850	PROFESSIONAL & SCIENTIFIC EQUIPMENT	0.00	0.31	0.00	0.10	0.00	0.08
3900	OTHER MANUFACTURED PRODUCTS	1.37	1.03	1.26	0.59	0.72	0.44

SOURCE: UNIDO DATA BASE,INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE,WITH ESTIMATES BY THE UNIDO SECRETARIAT.

FOOTNOTES:
A/ 3000-3530

INDONESIA

GROSS OUTPUT,VALUE ADDED,GROSS FIXED CAPITAL FORMATION
MONEY VALUES IN NATIONAL CURRENCY(AT CURRENT PRICES)

ISIC	ISIC-DESCRIPTION	GROSS OUTPUT AT PRODUCERS" VALUES (MILLIONS) 1970	GROSS OUTPUT AT PRODUCERS" VALUES (MILLIONS) 1980	VALUE ADDED AT FACTOR VALUES (MILLIONS) 1970	VALUE ADDED AT FACTOR VALUES (MILLIONS) 1980	GROSS FIXED CAPITAL FORMATION (MILLIONS) 1970	GROSS FIXED CAPITAL FORMATION (MILLIONS) 1980
3000	TOTAL MANUFACTURING	300420 A/	6818400 A/	91210 A/	[illegible]130000 A/	37400	452840
3110	FOOD PRODUCTS	104970	1013600	32520	235900	15120	40790
3130	BEVERAGES	3760	78000	1725	32100	70	4580
3140	TOBACCO	93410	1204000	26240	406700	1320	13660
3210	TEXTILES	38945	841300	10780	263400	10200	107300
3220	WEARING APPAREL,EXCEPT FOOTWEAR	775	28700	655	9100	0	3690
3230	LEATHER PRODUCTS	620	18400	170	3300	170	1360
3240	FOOTWEAR,EXCEPT RUBBER OR PLASTIC	2530	31300	1550	16400	120	2240
3310	WOOD PRODUCTS,EXCEPT FURNITURE	2250	376800	785	149800	100	43730
3320	FURNITURE,EXCEPT METAL	360	8800	170	3600	0	1140
3410	PAPER AND PRODUCTS	765	102500	240	31900	10	7700
3420	PRINTING AND PUBLISHING	2525	89300	785	31900	290	8140
3510	INDUSTRIAL CHEMICALS	3060	316000	1265	90800	730	21280
3520	OTHER CHEMICALS	16100	369400	4315	151300	1030	22210
3530	PETROLEUM REFINERIES	...	...	...	...	0	0
3540	MISC. PETROLEUM AND COAL PRODUCTS	0	0	0	0	0	0
3550	RUBBER PRODUCTS	8735	540400	1240	102600	4620	13280
3560	PLASTIC PRODUCTS	1315	71200	280	15500	300	7910
3610	POTTERY,CHINA,EARTHENWARE	215	12400	45	5100	0	7680
3620	GLASS AND PRODUCTS	795	40100	160	22500	10	7210
3690	OTHER NON-METALLIC MINERAL PRODUCTS	5490	245600	2865	125100	280	68430
3710	IRON AND STEEL	...	237700	...	67000	0	8130
3720	NON-FERROUS METALS	...	0	...	0	0	0
3810	FABRICATED METAL PRODUCTS	7540	285300	3040	74200	1130	20340
3820	MACHINERY,EXCEPT ELECTRICAL	1170	81300	415	33400	80	3540
3830	MACHINERY ELECTRIC	1190	387200	375	112600	330	16020
3840	TRANSPORT EQUIPMENT	2980	402800	845	136100	1460	20340
3850	PROFESSIONAL & SCIENTIFIC EQUIPMENT	0	2800	0	1400	0	120
3900	OTHER MANUFACTURED PRODUCTS	920	24700	745	8300	30	1940

SOURCE: UNIDO DATA BASE,INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE,WITH ESTIMATES BY THE UNIDO SECRETARIAT.

FOOTNOTES:

A/ 3000 3530

INDONESIA

GROSS OUTPUT, VALUE ADDED, GROSS FIXED CAPITAL FORMATION
BRANCH SHARES (IN PERCENT) IN TOTAL MANUFACTURING

ISIC	ISIC-DESCRIPTION	GROSS OUTPUT AT PRODUCERS" VALUES (PERCENT) 1970	GROSS OUTPUT AT PRODUCERS" VALUES (PERCENT) 1980	VALUE ADDED AT FACTOR VALUES (PERCENT) 1970	VALUE ADDED AT FACTOR VALUES (PERCENT) 1980	GROSS FIXED CAPITAL FORMATION (PERCENT) 1970	GROSS FIXED CAPITAL FORMATION (PERCENT) 1980
3000	TOTAL MANUFACTURING	100.00 A/	100.00 A/	100.00 A/	100.00 A/	100.00	100.00
3110	FOOD PRODUCTS	34.94	14.87	35.65	11.08	40.43	9.01
3130	BEVERAGES	1.25	1.16	1.89	1.51	0.19	1.01
3140	TOBACCO	31.09	17.66	28.77	19.09	3.53	3.02
3210	TEXTILES	12.96	12.34	11.82	12.37	27.27	23.71
3220	WEARING APPAREL, EXCEPT FOOTWEAR	0.26	0.42	0.72	0.43	0.00	0.81
3230	LEATHER PRODUCTS	0.21	0.27	0.19	0.15	0.45	0.30
3240	FOOTWEAR, EXCEPT RUBBER OR PLASTIC	0.84	0.46	1.70	0.77	0.32	0.49
3310	WOOD PRODUCTS, EXCEPT FURNITURE	0.75	5.59	0.86	7.03	0.27	9.66
3320	FURNITURE, EXCEPT METAL	0.12	0.13	0.19	0.17	0.00	0.25
3410	PAPER AND PRODUCTS	0.25	1.50	0.26	1.50	0.03	1.70
3420	PRINTING AND PUBLISHING	0.84	1.31	0.86	1.50	0.78	1.80
3510	INDUSTRIAL CHEMICALS	1.02	4.63	1.39	4.26	1.95	4.70
3520	OTHER CHEMICALS	5.36	5.42	4.73	7.10	2.75	4.90
3530	PETROLEUM REFINERIES	...	...	...	...	0.00	0.00
3540	MISC. PETROLEUM AND COAL PRODUCTS	0.00	0.00	0.00	0.00	0.00	0.00
3550	RUBBER PRODUCTS	2.91	7.93	1.36	4.82	12.35	2.93
3560	PLASTIC PRODUCTS	0.44	1.04	0.31	0.73	0.80	1.75
3610	POTTERY, CHINA, EARTHENWARE	0.07	0.18	0.05	0.24	0.00	1.70
3620	GLASS AND PRODUCTS	0.26	0.71	0.18	1.06	0.03	1.59
3690	OTHER NON-METALLIC MINERAL PRODUCTS	1.83	3.60	3.14	5.87	0.75	15.11
3710	IRON AND STEEL	...	3.49	...	3.15	0.00	1.80
3720	NON-FERROUS METALS	...	0.00	...	0.00	0.00	0.00
3810	FABRICATED METAL PRODUCTS	2.51	4.18	3.33	3.48	3.02	4.49
3820	MACHINERY, EXCEPT ELECTRICAL	0.39	1.19	0.45	1.57	0.21	0.78
3830	MACHINERY ELECTRIC	0.40	5.68	0.41	5.29	0.88	3.54
3840	TRANSPORT EQUIPMENT	0.99	5.91	0.93	6.39	3.90	4.49
3850	PROFESSIONAL & SCIENTIFIC EQUIPMENT	0.00	0.04	0.00	0.07	0.00	0.03
3900	OTHER MANUFACTURED PRODUCTS	0.31	0.36	0.82	0.39	0.08	0.43

SOURCE: UNIDO DATA BASE, INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE, WITH ESTIMATES BY THE UNIDO SECRETARIAT.

FOOTNOTES:

A/ 3000 3530

INDONESIA

PERFORMANCE OF MANUFACTURING SECTOR BY BRANCHES

ISIC	ISIC-DESCRIPTION	VALUE ADDED PER EMPLOYEE (THOUSAND US$) 1970	1980	VALUE ADDED PER ESTABLISHMENT (THOUSAND US$) 1970	1980	SHARE OF WAGES & SALARIES IN VALUE ADDED PERCENT 1970	1980	SHARE OF GFCF IN VALUE ADDED PERCENT 1970	1980	SHARE OF VALUE ADDED IN GROSS OUTPUT PERCENT 1970	1980
3000	TOTAL MANUFACTURING	0.5A/	3.5A/	49A/	423A/	27.5A/	21.1A/	...	...	30.4A/	31.2A/
3110	FOOD PRODUCTS	1.0	2.5	85	225	22.9	30.3	46.5	17.3	31.0	23.3
3130	BEVERAGES	1.2	7.1	95	514	19.1	25.9	4.1	14.3	45.9	40.7
3140	TOBACCO	0.5	4.1	83	910	14.2	8.3	5.0	3.4	28.1	33.8
3210	TEXTILES	0.2	1.8	18	215	53.0	29.3	94.6	40.8	27.7	31.3
3220	WEARING APPAREL,EXCEPT FOOTWEAR	0.6	0.9	22	109	5.3	53.6	...	40.5	84.5	31.7
3230	LEATHER PRODUCTS	0.3	1.7	17	132	47.1	34.5	100.0	41.2	27.4	17.9
3240	FOOTWEAR,EXCEPT RUBBER OR PLASTIC	1.3	3.5	185	460	16.1	20.1	7.7	13.7	61.3	52.4
3310	WOOD PRODUCTS,EXCEPT FURNITURE	0.3	4.1	20	496	45.9	20.8	12.7	29.2	34.9	39.8
3320	FURNITURE,EXCEPT METAL	0.3	1.0	11	42	52.9	65.8	...	31.7	47.2	40.9
3410	PAPER AND PRODUCTS	0.1	4.3	16	608	102.1	23.4	4.2	24.1	31.4	31.1
3420	PRINTING AND PUBLISHING	0.2	2.6	11	183	88.5	38.1	36.9	25.5	31.1	35.7
3510	INDUSTRIAL CHEMICALS	0.7	10.5	81	1498	34.8	18.8	57.7	23.4	41.3	28.7
3520	OTHER CHEMICALS	0.6	5.9	63	815	36.4	22.5	23.9	14.7	26.8	41.0
3530	PETROLEUM REFINERIES	...	...	...	...	...	...	...	...	...	...
3540	MISC. PETROLEUM AND COAL PRODUCTS	...	...	...	...	...	...	...	...	...	...
3550	RUBBER PRODUCTS	0.6	4.4	61	739	60.5	20.1	372.6	12.9	14.2	19.0
3560	PLASTIC PRODUCTS	0.1	1.4	10	112	96.4	39.0	107.1	51.0	21.3	21.8
3610	POTTERY,CHINA,EARTHENWARE	0.2	1.2	21	389	155.6	49.6	...	150.6	20.9	41.1
3620	GLASS AND PRODUCTS	0.1	4.0	17	735	87.5	25.2	6.3	32.0	20.1	46.8
3690	OTHER NON-METALLIC MINERAL PRODUCTS	0.9	6.5	38	351	30.7	13.9	9.8	54.7	52.2	50.9
3710	IRON AND STEEL	...	12.2	...	4661	...	13.3	...	12.1	...	28.2
3720	NON-FERROUS METALS	...	...	...	...	...	...	...	...	...	...
3810	FABRICATED METAL PRODUCTS	0.6	2.9	56	327	28.6	28.7	37.2	27.4	40.3	26.0
3820	MACHINERY,EXCEPT ELECTRICAL	0.3	4.5	24	405	67.5	24.3	19.3	10.6	35.5	41.1
3830	MACHINERY ELECTRIC	0.3	4.8	54	1594	53.3	21.6	88.0	14.2	31.5	29.1
3840	TRANSPORT EQUIPMENT	0.4	7.3	59	1223	49.7	20.2	172.8	14.9	28.4	33.8
3850	PROFESSIONAL & SCIENTIFIC EQUIPMENT	...	2.2	...	90	...	26.3	...	8.6	...	50.0
3900	OTHER MANUFACTURED PRODUCTS	0.3	2.3	30	160	24.2	23.6	4.0	23.4	81.0	33.6

SOURCE: UNIDO DATA BASE,INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE,WITH ESTIMATES BY THE UNIDO SECRETARIAT.

*/ VALUE ADDED(IN US $) WAS CALCULATED USING VALUE ADDED IN NATIONAL CURRENCY AND MID-YEAR EXCHANGE RATES

FOOTNOTES:

A/ 3000-3530

Annex Table 14

Productivity index - value added per employee relative to total manufacturing (=100)

1970 and 1980

		1970	1980
300	Total manufacturing	100	100
311	Food products	200	71
313	Beverages	240	203
314	Tobacco	100	117
321	Textiles	40	51
322	Wearing apparel, except footwear	120	26
323	Leather products	60	49
324	Footwear, exept rubber or plastic	260	100
331	Wood products, except furniture	60	117
332	Furniture, except metal	60	29
341	Paper and products	20	123
342	Printing and publishing	40	74
351	Industrial chemicals	140	300
352	Other chemicals	120	168
353	Petroleum refineries	...	...
354	Misc. petroleum and coal products	...	...
355	Rubber products	120	126
356	Plastic products	20	40
361	Pottery, china, earthenware	40	34
362	Glass and products	20	114
369	Other non-metallic mineral products	180	185
371	Iron and steel	...	349
372	Non-ferrous metals	...	...
381	Fabricated metal products	120	83
382	Machinery, except electrical	60	129
383	Machinery electric	60	137
384	Transport equipment	80	209
385	Professional + scientific equipment	...	63
390	Other manufactured products	60	66

Source: Annex Table 13.

Annex Table 15

Regional Distribution of Medium and Large Scale Manufacturing Enterprises 1974.

Region	Establishments		Persons Engaged Employees		Average Size	Value Added		Gross Output		Population	Persons Engaged Per (000) Pop.	No. of Estab. per Mill. Pop.
	Number	Percentage Share	(000)	Percentage Share	Empl. per Estab.	Rp. Bill.	Percentage Share	Rp. Bill.	Percentage Share	Mill.		
Sumatra	562	7.9	54.9	8.3	98	57.8	12.1	173.4	13.4	23.3	2.35	24
Java Total	6,034	85.1	572.2	86.4	94	395.2	82.9	842.2	65.1	82.7	6.92	73
Jakarta	878	12.4	27.9	13.3	100	92.9	19.5	288.0	22.3	5.6	15.70	157
Java, West	1,598	22.5	116.6	17.6	73	90.6	19.0	205.2	15.9	23.3	5.01	68
Java, Central	1,584	22.3	147.9	22.3	93	73.0	15.3	24.2	1.9	23.6	6.26	67
Yogjakarta	155	2.2	13.8	2.1	89	6.4	1.3	20.2	1.6	2.7	5.11	57
Java, East	1,814	25.7	206.0	31.1	113	132.3	27.7	304.7	23.5	27.5	7.49	66
Kalimantan	162	2.3	14.6	2.2	90	13.0	2.7	37.6	2.9	5.7	2.57	28
Sulawesi	167	2.4	9.3	1.3	50	9.2	1.9	25.2	1.9	9.4	0.88	18
Others	166	2.3	11.7	1.8	120	3.3	0.7	15.4	1.2	9.5	1.50	17
Total	7,091	100.0	661.7	100.0	93	478.5	100.0	1,093.8	100.0	130.6	5.07	54

Source: BPS 1974-1975 Industrial Census.

Annex Table 16

Number of establishment, persons engaged and value added by size and branch of industry, 1974/75

ISIC	Description	Number of establishments: Cottage	Number of establishments: Small	Number of establishments: Medium	Number of establishments: Large	Number of establishments: M and L	Persons engaged: Cottage Number	Persons engaged: Cottage %	Persons engaged: Small Number	Persons engaged: Small %	Persons engaged: M and L Number	Persons engaged: M and L %	Value added (Mill. Rp.): Cottage	%	Value added (Mill. Rp.): Small	%	Value added (Mill. Rp.): M and L	%
311,2	Food products	429,250	22,559	1,307	231	1,538	1,380,720	35.4	143,908	41.9	135,643	20.5	36,053.3	43.7	24.756.2	46.7	110,114.2	23.1
313	Beverages	1,670	416	52	8	60	5,495	0.1	3,512	1.0	4,704	0.7	205.6	0.2	540.5	1.0	14,435.1	3.0
314	Tobacco	3,364	1,300	550	219	769	14,962	0.4	3,774	1.1	128,041	19.4	1,040.9	1.3	340.9	0.6	102,174.4	21.4
321	Textiles	129,390	4,649	1,638	298	1,936	398,855	10.2	46,757	13.6	164,998	24.9	4,892.9	5.9	4,789.4	9.1	67,807.9	14.2
322	Wearing apparel	7,803	625	67	5	72	26,288	0.7	4,770	1.4	2,617	0.4	1,372.0	0.2	683.8	1.3	536.8	o.1
323	Leather and products	1,018	155	22	5	27	4,225	0.1	1.182	0.3	1.549	0.2	293.2	0.4	251.8	0.5	749.7	0.2
324	Footwear	1,469	363	27	4	31	5,756	0.2	2,666	0.8	5,082	0.8	575.3	0.7	528.9	1.0	3,118.2	0.7
331	Wood products	502,061	3,224	281	41	322	1,536,372	39.4	25,566	7.4	19,034	2.9	17,426.2	21.1	4,543.0	8.6	11,327.6	2.4
332	Furniture and fixtures	32,801	2,232	77	8	85	107,632	2.7	16,114	4.7	3,334	0.5	4,522.4	5.5	2,448.5	4.6	1,207.0	0.2
341	Paper and products	1,524	65	45	15	60	5,144	0.1	660	0.2	7,281	1.1	206.4	0.3	72.4	0.1	6,300.7	1.3
342	Printing, publishing	1,104	802	198	31	221	4,334	0.1	7,407	2.2	14,701	2.2	274.8	0.3	1,626.1	3.1	6,396.2	1.3
351	Industrial chemicals	-	120	51	15	66	-		1,084	0.3	4,509	0.7	-		453.7	0.9	4,734.3	1.0
352	Other chemical products	1,984	503	172	56	228	8,013	0.2	4,255	1.2	24,292	3.7	407.6	0.5	1,020.2	1.9	16,472.8	3.4
353	Petroleum refineries	-	-	-	-	-	-		-		-		-		-		-	
354	Petroleum, coal products	-	-	-	-	-	-		-		-		-		-		-	
355	Rubber products	1,541	454	329	139	468	6,275	0.2	4,141	1.2	45,745	6.9	291.8	0.4	1,277.8	2.4	38,165.7	8.0
356	Plastic products nec	1,792	302	112	25	137	6,658	0.2	2,910	0.8	9,256	1.4	440.7	0.5	587.8	1.1	3,121.6	0.6
361	Pottery, china, etc.	21,010	204	18	4	22	61,549	1.6	1,428	0.4	1,068	0.2	834.9	1.0	119.2	0.2	254.5	0.1
362	Glass and products	-	21	31	19	50	-		196	0.1	5,124	0.8	-		34.2	0.1	2,617.4	0.5
369	Non-metal products, nec	59,589	6,524	390	20	410	201,654	5.2	45,292	13.2	18,405	2.8	8,699.8	10.5	4,349.7	8.2	13,760.4	2.9
371	Iron and steel	-	2	6	3	9	-		21	0	933	0.1	-		-		829.6	0.2
372	Non-ferrous metals	-	4	3	6	9	-		29	0	1,127	0.2	-		7.9	0	3,169.1	0.7
381	Metal products	13,600	2,265	181	58	239	49,531	1.3	16,165	4.7	21,292	3.2	2,540.1	3.1	2,309.7	4.4	12,183.3	2.6
382	Machinery nec	-	162	52	16	68	-		1,419	0.4	7,311	1.1	-		301.0	0.6	9,236.3	1.9
383	Electrical machinery	-	63	38	28	66	-		553	0.2	12,175	1.8	-		308.7	0.6	16,058.5	3.4
384	Transport equipment	1,832	426	79	33	112	6,242	0.2	3,536	1.0	14,607	2.2	419.9	0.5	873.8	1.6	22,646.8	4.7
385	Professional goods	-	40	12	1	13	-		390	0.1	482	0.1	-		73.2	0.1	155.4	0
390	Other industries	21,709	708	52	13	65	65,282	1.7	5,499	1.6	8,394	1.3	2,066.6	2.5	720.1	1.4	10,550.9	2.2
300	Total industry	1,234,511	48,186	5,790	1,301	7,091	3,894,987	100.0	343,234	100.0	661,704	100.0	.82,564.5	100.0	53,027.5	100.0	476,947.2	100.0

Source: BPS 1974/75 Industrial Census.

Number of Employees by Industry and by Location, Indonesia, 1974/75
(Thousands and Percentages)

		Java		Outer Islands		Indonesia	
ISIC	Industry	'000	%	'000	%	'000	%
31	Food, etc.	274.5	45	23.1	25	297.6	42
(311,2)	Food	(126.3)	(21)	(17.2)	(18)	(143.5)	(20)
(313)	Beverages	(4.6)	(1)	(0.2)	(..)	(4.8)	(1)
(314)	Tobacco	(143.6)	(24)	(5.7)	(6)	(149.3)	(21)
32	Textiles	172.7	28	7.7	8	180.3	26
(321)	Weaving	(164.3)	(27)	(7.4)	(8)	(171.7)	(24)
(322,3,4)	Wearing apparel	(8.4)	(1)	(0.3)	(..)	(8.6)	(1)
33	Wood Products	5.9	1	18.2	19	24.1	3
34	Paper, printing	19.1	3	3.1	3	22.5	3
35	Chemical products	58.8	10	29.4	31	88.2	13
(351,2,6)	Chemical products	(37.2)	(6)	(4.6)	(5)	(41.9)	(6)
(355)	Rubber	(21.6)	(4)	(24.8)	(26)	(46.3)	(7)
36	Non-metals	20.4	3	5.6	6	25.9	4
37	Basic metals	1.5	..	0.6	1	2.0	..
38	Fabricated metals	51.9	9	4.4	5	56.3	8
39	Other	3.4	1	1.5	2	4.9	1
	Total	608.3	100	93.6	100	701.9	100

Source: The World Bank: Selected issues of industrial development and trade strategy. Annex I, The Structure of the Manufacturing Sector, 15 July 1981, p. 39 based on BPS 1974/75 Industrial Census.

Large and medium enterprises, number of establishments, employment, value added and average size by ownership 1974/75

	Establishment		Employment		Value added	Output	Fixed capital formation	Average size
	Number	Percentage share	(000)	Percentage share	Percentage share	Percentage share	Percentage share	Number of employed persons per establishment
Government	481	6.8	126.8	19.3	25.0	19.3	13.7	264
Domestic private	6,230	87.9	450.2	68.7	47.0	56.8	39.5	72
Foreign	101	1.4	16.9	2.6	10.8	8.2	7.1	167
Government and domestic private	84	1.2	8.2	1.2	1.5	1.3	1.1	98
Government and foreign	14	0.2	4.5	0.7	2.1	1.7	1.3	320
Foreign and domestic private	177	2.4	47.8	7.3	13.3	12.5	36.5	270
Others	4	0.1	1.4	0.2	0.3	0.2	0.8	345
Total	7,091	100.0	655.8	100.0	100.0	100.0	100.0	93

Source: BPS 1974/75 Industrial Census, Jakarta, 1978.

Sectoral Value Added by Ownership, 1974/75 (Values in Bill. Rp.)

		Total			Foreign			Government			Private domestic		
		N	VA	%	N	VA	%VA	N	VA	%VA	N	VA	%VA
311,2	Food manufacturing	1,448	115.728	100	50	13.164	11.4	180	67.307	58.1	1,218	35.257	30.5
313	Beverages	59	14.438	100	4	8.424	58.4	3	0.142	1.0	52	5.872	40.7
314	Tobacco	747	105.132	100	46	39.540	37.6	37	1.181	1.1	664	64.411	61.3
321	Textiles	1,880	68.815	100	25	16.705	24.3	49	9.968	14.5	1,806	42.142	61.2
322	Wearing apparel	60	0.460	100	2	0.035	7.6	1	0.001	0.2	57	0.424	92.2
323	Leather substitutes	24	0.644	100	2	0.008	1.2	1	0.021	3.3	21	0.615	95.5
324	Footwear	29	2.966	100	1	1.577	53.2	-	-	-	28	1.389	46.8
331	Wood and wood products	302	10.780	100	14	1.425	13.2	20	0.652	6.0	268	8.703	80.8
332	Furniture (nonmetallic)	86	1.162	100	3	0.019	1.6	4	0.099	8.5	79	1.044	89.9
341	Paper and paper products	58	5.086	100	5	1.441	28.3	6	2.704	53.2	47	0.941	18.5
342	Printing and publishing	222	6.343	100	2	0.043	0.7	25	1.779	28.0	195	4.521	71.3
351	Basic chemicals	67	83.444	100	6	1.297	1.6	14	8.923	10.7	47	73.224	87.7
352	Other chemical products	218	16.969	100	27	6.813	40.1	15	1.511	8.9	176	8.645	50.9
355	Rubber	453	38.152	100	36	8.150	21.4	115	10.120	26.5	302	19.882	52.1
356	Plastic wares	129	3.057	100	7	0.327	10.7	-	-	-	122	2.730	89.3
361	Pottery, china and ware	19	0.245	100	-	-	-	1	0.006	2.4	18	0.239	97.6
362	Glass and glass products	51	4.990	100	4	3.520	70.5	2	0.484	9.7	45	0.986	19.8
363	Cement	206	12.071	100	1	0.897	7.4	17	9.461	78.4	188	1.713	14.2
364	Structural clay products	147	1.079	100	-	-	-	8	0.124	11.5	139	0.955	88.5
369	Other nonmetallic mineral products	12	0.295	100	-	-	-	1	0.098	33.2	11	0.197	66.8
371	Iron and steel	6	0.699	100	-	-	-	-	-	-	6	0.699	100.0
372	Nonferrous metal	9	3.169	100	5	2.551	80.5	-	-	-	4	0.618	19.5
381	Fabricated metal products	232	11.996	100	18	2.885	24.0	12	0.741	6.2	202	8.370	69.8
382	Machinery	66	8.383	100	5	1.204	14.4	11	5.234	62.4	50	1.945	23.2
383	Electrical machinery	60	15.722	100	9	9.235	58.7	3	0.113	0.7	48	6.374	40.6
384	Transport equipment	103	21.894	100	6	7.519	34.3	18	5.618	25.7	79	8.757	40.0
385	Measuring and optical equipment	13	0.153	100	-	-	-	-	-	-	13	0.153	100.0
390	Other manufacturing	52	1.477	100	4	0.841	56.9	4	0.194	13.2	44	0.442	29.9
	Total	6,758	555.350	100	282	127.620	23.0	547	126.480	22.8	5,929	301.240	54.2

Source: The World Bank: Selected issues of Industrial Development and Trade Strategy, Annex I, The Structure of the Manufacturing Sector, 15 July 1981, p. 43 based on BPS, 1974/75 Industrial Census.

Note: N = Number of firms
VA = Value added

Annex Table 18 b

Annex Table 19

Approved Domestic Investment Projects by Sector 1968-1981[a/]

(Millions of Rupiah)

Sector	1968-1977	1978	1979	1980	1981	Total	
						Value	Project
1. Agriculture	181,841	100,409	36,410	126,942	165,142	610,744	184
2. Forestry	247,862	58,459	81,802	397,620	362,132	1,147,875	474
3. Mining	50,045	18,347	32,882	37,092	13,462	151,828	25
4. Manufacturing	1,701,270	531,214	502,343	861,462	1,469,529	5,065,818	2,572
5. Construction	13,006	2,590	2,060	1,531	15,076	34,263	10
6. Hotel and tourism	90,645	11,571	12,418	1,032	52,620	168,286	127
7. Housing and offices	168,864	15,071	3,778	23,961	-12,489	199,185	48
8. Other services	139,044	24,160	16,936	53,923	71,712	305,775	160
Total	2,592,577	761,821	688,629	1,503,563	2,137,184	7,683,774	3,600

Source: Investment Coordinating Board.

a/ Includes cancellations of projects formerly under the foreigh capital investment law.

Annex Table 20

Approved Foreign Investment Projects by Origin 1967-1981[a]

(Millions of $)

	1967-1975	1976	1977	1978	1979	1980	1981	Total Value	Total Project
1. Europe	469.3	45.1	50.8	53.0	94.3	233.9	134.2	1,080.6	158
-Belgium	35.7	5.2	4.0	0.8	8.0	40.7	45.8	140.2	15
-France	13.2	7.3	0.2	5.5	---	0.4	---	26.6	8
-Germany, Fed. Rep. of	175.0	9.8	6.6	1.4	4.0	23.4	13.9	234.1	24
-Netherlands	156.8	16.1	6.9	32.9	2.9	145.5	50.2	411.3	44
-United Kingdom	40.0	6.7	7.8	4.9	45.3	4.8	14.9	124.4	[illegible]
-Others	48.6	---	25.3	7.5	34.1	19.1	9.4	144.0	6
2. America	209.2	14.5	35.0	29.5	53.2	138.2	17.6	497.2	87
-Canada	2.4	---	2.4	4.6	---	---	---	9.4	2
-United States of America	193.2	14.5	29.5	21.9	53.0	136.9	9.7	458.7	79
-Others	13.6	---	3.1	3.0	0.2	1.3	7.9	29.1	6
3. Asia	2,628.4	330.7	279.4	225.1	1,191.3[b]	179.0	763.5	5,597.4	423
-Hongkong	413.7	165.6	127.3	61.9	116.6	47.2	292.9	1,225.2	126
-Japan	2,040.2	91.8	104.3	162.2	1,037.4[b]	73.5	234.7	3,744.1	207
-Malaysia	21.8	1.0	---	---	4.8	---	1.2	28.8	15
-Philippines	19.8	0.8	3.8	---	2.9	6.2	4.8	38.2	8
-Singapore	46.9	3.0	32.1	0.8	6.1	33.2	20.6	142.7	31
-Thailand	2.4	0.2	---	0.2	---	1.8	3.1	7.7	4
-Others	83.6	68.3	11.9	---	23.5	17.1	206.2	410.6	32
4. Africa	11.4	---	---	4.5	---	4.3	---	20.2	2
-Liberia	11.4	---	---	4.5	---	4.3	---	20.2	2
5. Australia	227.0	11.0	2.2	---	8.3	1.8	19.3	269.6	37
6. Group of country	1,287.0	37.5	279.7	90.6	491.8	349.5	244.7	2,780.8	80
Total	4,832.3	438.8	647.1	402.7	1,838.9[b]	906.7	1,179.3	10,245.8	787

Source: Bank Indonesia, Report for the Financial Year 1981/82.

a/ After taking into account the cancellations and shifting of projects from foreign to domestic investment.
b/ Revised figures.

INDONESIA PRODUCT MIX OF TRADED MANUFACTURED GOODS ,1970,1975,1980 a/

SITC	DESCRIPTION OF TRADE GOODS	EXPORTS 1970 PERCENT IN TOTAL MANUFACTURES	EXPORTS 1975 PERCENT	EXPORTS 1980 PERCENT	EXPORTS 1980 (1000 US $)	IMPORTS 1970 PERCENT IN TOTAL MANUFACTURES	IMPORTS 1975 PERCENT	IMPORTS 1980 PERCENT	IMPORTS 1980 (1000 US $)
01	MEAT AND MEAT PREPARATIONS	...	0.317	0.163	4779	...	0.048	0.060	5581
02	DAIRY PRODUCTS AND EGGS	...	0.041	0.021	603	...	0.605	0.857	80080
032	FISH N.E.S. AND FISH PREPARATIONS	0.557	0.001	0.017	502	...	0.044	0.030	2815
0422	RICE,GLAZED OR POLISHED NOT OTHERWISE WORKED	...	0.016	0.103	3043	...	7.221	7.391	690424
046	MEAL AND FLOUR OF WHEAT OR OF MESLIN	...	0.036	...	...	...	0.056	0.061	5714
047	MEAL AND FLOUR OF CEREALS,EXCEPT ABOVE	...	0.009	...	...	...	0.006	0.001	52
048	CEREALS PREPARAT. & STARCH OF FRUITS & VEGETAB.	...	0.068	0.136	4001	...	0.115	0.071	6644
052	DRIED FRUIT	0.026	0.001	0.002	67	...	0.008	0.017	1549
053	FRUIT,PRESERVED AND FRUIT PREPARATIONS	0.014	0.094	0.142	4183	...	0.035	0.051	4793
055	VEGETABLES,ROOTS & TUBERS,PRESERVED OR PREPARED	6.100	0.013	0.127	3735	...	0.087	0.161	15063
06	SUGAR,SUGAR PREPARATIONS AND HONEY	1.832	1.078	0.781	22976	...	0.759	1.749	163368
0713	COFFEE EXTRACTS,ESSENCES,CONCENTRATES & SIMILAR	0.001	...	0.079	2324	...	0.001	0.002	198
0722	COCOA POWDER,UNSWEETENED	...	0.039	0.615	18077	...	0.002	0.018	1661
0723	COCOA BUTTER AND COCOA PASTE	0.000	0.117	0.054	1584	...	0.001	0.000	9
073	CHOCOLATE AND RELATED FOOD PREPARATIONS	...	...	...	...	...	0.009	0.005	508
074	TEA AND MATE	13.607	5.845	3.832	112669	...	0.001	0.002	162
081	FEEDING-STUFF FOR ANIMALS	4.852	4.929	3.547	104312	...	0.012	0.410	38313
09	MISCELLANEOUS FOOD PREPARATIONS	0.222	0.129	0.086	2541	...	0.066	0.088	8174
11	BEVERAGES	0.066	0.019	0.012	359	...	0.075	0.109	10145
122	TOBACCO MANUFACTURES	0.625	1.514	0.049	1450	...	0.156	0.057	5297
2219	FLOUR AND MEAL OF OIL SEEDS,NUTS,KERNELS	...	0.004	...	...	...	0.006	0.002	219
231	CRUDE RUBBER,SYNTH. & RECLAIMED(EXCL.SITC 2311)	0.000	0.000	0.000	0	...	0.035	0.209	19558
243	WOOD,SHAPED OR SIMPLY WORKED	1.694	3.575	8.611	253202	...	0.003	0.000	22
251	PULP AND WASTE PAPER	0.000	0.000	...	...	...	0.112	0.672	62766
2626	WOOL SHODDY	...	...	...	...	...	0.000	0.000	6
2627	WOOL OR OTHER ANIMAL HAIR,CARDED OR COMBED	0.012	...	...	...	...	0.000	...	...
2628	WOOL TOPS	...	...	...	...	...	...	0.014	1311
2629	WASTE OF WOOL AND OTHER ANIMAL HAIR N.E.S.	...	...	...	...	...	...	0.000	2
263	COTTON	...	...	0.000	4	...	1.968	2.043	190686
266	SYNTHETIC AND REGENERATED(ARTIFICIAL) FIBRES	...	...	0.002	46	...	0.717	1.020	95252
267	WASTE MATERIALS FROM TEXTILE FABRICS(INCL.RAGS)	...	0.002	0.002	58	...	0.031	0.025	2381
332	PETROLEUM PRODUCTS	28.144	44.819	40.383	1187453	...	4.408	7.410	692224
4	ANIMAL AND VEGETABLE OILS AND FATS	27.176	18.144	9.686	284805	...	0.060	0.095	8848
411	ANIMAL OILS AND FATS	...	0.001	0.005	132	...	0.011	0.008	748
421	FIXED VEGETABLE OILS,SOFT(INCL.SITC 422)	27.047	18.142	9.518	279871	...	0.018	0.009	859
431	ANIMAL AND VEGETABLE OILS AND FATS PROCESSED	0.128	0.000	0.163	4801	...	0.031	0.078	7241

Annex Table 21

INDONESIA

PRODUCT MIX OF TRADED MANUFACTURED GOODS ,1970,1975,1980 a/

SITC	DESCRIPTION OF TRADE GOODS	EXPORTS 1970 PERCENT IN TOTAL MANUFACTURES	EXPORTS 1975 PERCENT IN TOTAL MANUFACTURES	EXPORTS 1980 PERCENT IN TOTAL MANUFACTURES	EXPORTS 1980 (1000 US $)	IMPORTS 1970 PERCENT IN TOTAL MANUFACTURES	IMPORTS 1975 PERCENT IN TOTAL MANUFACTURES	IMPORTS 1980 PERCENT IN TOTAL MANUFACTURES	IMPORTS 1980 (1000 US $)
5	CHEMICALS	4.018	2.754	2.850	83805	...	17.929	13.435	1255020
51	CHEMICALS ELEMENTS AND COMPOUNDS	...	0.214	0.419	12322	...	2.655	5.523	515953
52	TAR AND CHEMICALS FROM COAL;PETROLEUM,NAT, GAS	...	0.000	0.057	1679	...	0.012	0.009	837
53	DYEING;TANNING AND COLOURING MATERIALS	0.215	0.015	0.052	1540	...	1.267	1.043	97439
54	MEDICINAL AND PHARMACEUTICAL PRODUCTS	2.029	1.409	0.397	11668	...	0.725	0.855	79871
55	ESSENTIAL OILS AND PERFUME MATERIALS	1.570	1.090	0.734	21571	...	0.339	0.436	40740
56	FERTILIZERS,MANUFACTURED	0.001	0.020	1.187	34892	...	8.908	0.770	71915
57	EXPLOSIVES AND PYROTECHNIC PRODUCTS	...	...	...	...	...	0.082	0.098	9120
58	PLASTIC MATERIALS,REGENERATED CELLUL. & RESINS	...	0.001	0.001	29	...	2.020	3.269	305400
59	CHEMICAL MATERIALS AND PRODUCTS N.E.S.	0.204	0.005	0.004	105	...	1.921	1.432	133744
6	MANUFACTURED GOODS CLASSIFIED BY MATERIAL	8.166	10.433	20.905	614700	...	23.850	21.981	2053326
61	LEATHER MANUFACTURED N.E.S. & DRESSED FUR SKINS	0.298	0.066	0.235	6909	...	0.012	0.014	1313
62	RUBBER MANUFACTURES N.E.S.	0.014	0.021	0.015	432	...	0.657	0.606	56614
63	WOOD AND CORK MANUFACTURES(EXCL.FURNITURE)	0.084	0.123	2.500	73519	...	0.078	0.036	3378
64	PAPER,PAPER BOARD AND MANUFACTURES THEREOF	0.000	0.039	0.161	4734	...	1.339	1.840	171886
65	TEXTILE YARN,FABRICS,MADE-UP ARTICLES	1.365	0.222	1.559	45828	...	3.426	2.323	216975
66	NON-METALLIC MINERAL MANUFACTURES;N.E.S.	0.005	0.039	1.085	31901	...	2.203	1.353	126362
67	IRON AND STEEL	...	0.041	0.639	18776	...	10.837	10.349	966700
68	NON-FERROUS METALS	6.036	9.518	14.524	427072	...	1.472	2.077	194025
69	MANUFACTURES OF METAL,N.E.S.	0.364	0.365	0.188	5528	...	3.827	3.384	316075
7	MACHINERY AND TRANSPORT EQUIPMENT	2.664	3.635	3.706	108962	...	39.357	38.900	3633821
71	MACHINERY,OTHER THAN ELECTRIC	2.664	1.674	0.139	4095	...	18.298	19.858	1855004
72	ELECTRICAL MACHINERY,APPARATUS AND APPLIANCES	...	1.468	3.304	97143	...	8.785	8.014	749641
73	TRANSPORT EQUIPMENT	...	0.493	0.263	7724	...	12.275	11.028	1030176
8	MISCELLANEOUS MANUFACTURED ARTICLES	0.223	2.374	4.089	120242	...	2.213	3.053	285192
81	SANITARY,PLUMBING,HEATING & LIGHTNING FIXTURES	...	0.015	0.009	250	...	0.206	0.139	13007
82	FURNITURE	...	0.025	0.106	3111	...	0.125	0.092	8581
83	TRAVEL GOODS,HANDBAGS AND SIMILAR ARTICLES	...	0.000	0.019	550	...	0.021	0.016	1517
84	CLOTHING	0.001	0.276	3.342	98274	...	0.107	0.033	3095
85	FOOTWEAR	0.009	0.025	0.049	1450	...	0.044	0.025	2376
86	PROFESSIONAL,SCIENT. & CONTROLL. INSTRUMENTS	...	0.856	0.128	3766	...	0.948	1.416	132299
89	MISCELLANEOUS MANUFACTURED ARTICLES,N.E.S.	0.213	1.177	0.437	12841	...	0.764	1.331	124317

	EXPORTS 1970	EXPORTS 1975	EXPORTS 1980	IMPORTS 1970	IMPORTS 1975	IMPORTS 1980
TOTAL MANUFACTURES	134535	881867	2940488	...	4504732	9341385
TOTAL: SITC 5-8 LESS 68 b/	12155	85350	500636	...	3688363	7033334
TOTAL TRADED GOODS: SITC 0-9	1055090	7130200	21908890	...	4769717	10834394

NOTE:DATA AND SITC DESCRIPTIONS REFER TO SITC REVISION 1

a/ THIS TABLE IS BASED ON THE DEFINITION OF TRADE IN MANUFACTURES COVERING A LIST OF 148 SPECIFICALLY IDENTIFIED SITC 3-DIGIT OR 4-DIGIT CODES COMPRISING A WIDE RANGE OF PROCESSING STAGES OF MANUFACTURED GOODS.

b/ DEFINITION OF TRADE IN MANUFACTURES SITC 5-8 LESS 68 IS ONE OF THE MOST OFTEN FOUND. IT COVERS ONLY ITEMS RECOGNIZED AS EXCLUSIVELY MANUFACTURED GOODS,I.E. WITH A HIGH LEVEL OF MANUFACTURING CONTENT.

SOURCE: UNIDO DATA BASE;INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE.

(Annex Table 21 continued)

INDONESIA

INDICATORS OF EXPORT PERFORMANCE BY PRODUCT GROUP, 1970-1972 AND 1976-1978
(PERCENTAGE)

EXPORT (SITC)	External effects: Demand in world market	External effects: Change in market composition	Internal effects: Change in product composition	Internal effects: Competitiveness	Compound rate of growth 1970-1978
Total manufactures (5 to 8)	21.0	0.7	0.5	77.7	52.7
Chemicals (5)	42.4	-1.2	-9.5	68.3	33.8
Manufactured goods classified chiefly by material (6)	25.3	1.6	3.4	69.7	53.4
Machinery and transport equipment (7)	...	...	...	...	...
Miscellaneous manufactured articles (8)	4.7	-1.0	0.9	95.4	79.5
Selected product groups:					
Leather, leather manufactures, n.e.s. and dressed fur skins (61)	33.9	7.0	-0.3	59.5	35.8
Rubber manufactures, n.e.s. (62)	28.0	-6.0	0.7	77.4	41.9
Wood and cork manufactures, excluding furniture (63)	5.3	4.6	1.8	88.2	95.5
Paper, paperboard and manufactures thereof (64)	...	...	...	...	...
Textile yarn, fabrics, made-up articles and related products (65)	162.6	-70.4	49.1	-41.3	15.9
Non-metallic mineral manufactures, n.e.s. (66)	5.8	-4.0	1.4	96.7	152.9
Iron and steel (67)	...	...	...	...	...
Non-ferrous metals (68)	17.3	2.7	10.4	69.7	55.8
Manufactures of metal, n.e.s. (69)	-37.3	-2.0	7.3	132.0	13.9
Machinery, other than electric (71)	...	...	...	...	...
Electrical machinery, apparatus and appliances (72)	...	...	...	...	...
Transport equipment (73)	...	...	...	...	...
Clothing and footwear (84,85)	...	...	...	...	...

Source: UNIDO Handbook of Industrial Statistics, ID/284; E.82.II.B.2, 1982.

Annex Table 23

Indonesia: export-performance indicators

SUMMARY STATISTICS

YEAR	POPULATION (THOUSANDS)	PER CAPITA GDP ($) (IN 1975 PRICES)	MVA/GDP (PER CENT)	SHARE IN WORLD EXPORTS OF MANUFACTURES (PER CENT)	SHARE OF MANUFACTURES IN TOTAL MERCHANDISE EXPORTS (PER CENT)
1970	119 467	173	6.7	0.052	12.7
1977	141 776	250	9.1	0.193	12.0

SITC CODE	NOTES	COMMODITY DESCRIPTION	SHARE IN TOTAL EXPORTS OF MANUFACTURES (PER CENT)		NET EXPORTS AS PERCENTAGE OF TOTAL TRADE		EXPORT-PERFORMANCE RATIO	
			1971	1976	1971	1976	1971	1976
032		FISH PREPARATIONS	0.785	0.023	23.63	-96.07	3.10	0.11
052		DRIED FRUIT	0.003	0.001	-93.45	-98.52	0.04	0.01
053		FRUIT,PRESERVED AND FRUIT PREPARATIONS	0.024	0.176	-83.67	-53.36	0.07	0.59
055		VEGETABLES,ROOTS & TUBERS,PRES. OR PREP.	5.441	0.435	92.63	-41.81	31.00	1.45
061,062	a/	SUGAR,SUGAR PREPARATIONS AND HONEY	2.303	0.797	-63.43	-88.89	3.45	0.95
074		TEA AND MATE	16.035	6.978	99.93	99.63	73.12	53.25
081		FEEDING-STUFF FOR ANIMALS	7.075	8.544	98.55	96.63	6.70	9.23
091		MARGARINE AND SHORTENING	0.047	0.000	39.46	-99.95	0.62	0.00
099		FOOD PREPARATIONS,N.E.S.	0.058	0.129	-91.10	-63.61	0.45	0.58
112		ALCOHOLIC BEVERAGES	0.043	0.020	-87.08	-93.27	0.04	0.02
122		TOBACCO MANUFACTURES	1.375	0.124	90.41	-79.47	4.37	0.45
243		WOOD,SHAPED OR SIMPLY WORKED	1.043	6.451	97.72	99.23	1.03	6.45
251		PULP AND WASTE PAPER	0.000	0.016	-99.92	-96.65	0.00	0.01
332		PETROLEUM PRODUCTS	20.420	44.649	23.09	-4.12	7.25	10.85
421,422		FIXED VEGETABLE OILS AND FATS	25.257	17.850	99.22	98.05	36.37	29.09
431		ANIMAL & VEGETABLE OILS & FATS PROCESSED	0.130	0.001	-33.71	-93.95	0.95	0.01
532		DYEING & TANNING EXTRACTS AND MATERIALS	0.058	0.017	23.71	-84.28	2.22	0.55
541		MEDICINAL AND PHARMACEUTICAL PRODUCTS	0.766	1.208	-87.50	-59.93	0.59	0.98
551		ESSENTIAL OILS,PERFUME & FLAVOUR MATLS.	2.200	1.526	-2.36	21.68	13.10	9.57
553		PERFUMERY & COSMETICS EXCEPT SOAPS	0.005	0.003	-96.62	-99.30	0.04	0.01
599		CHEMICAL MATERIALS & PRODUCTS N.E.S.	0.064	0.032	-98.96	-99.97	0.05	0.00
611		LEATHER	0.037	0.254	74.31	92.33	0.17	0.75
612		MANUFACTURES OF LEATHER OR RECONSTITUTES	0.034	0.025	-22.29	-67.82	0.53	0.37
629		ARTICLES OF RUBBER N.E.S.	0.018	0.015	-99.29	-99.02	0.02	0.02
632		WOOD MANUFACTURES N.E.S.	0.190	0.118	-59.82	-41.03	0.88	0.45
642		ARTICLES OF PULP,PAPER OR PAPERBOARD	0.000	0.000	-99.06	-99.93	0.00	0.00
652		COTTON FABRICS,WOVEN	0.626	0.025	-77.91	-94.11	0.83	0.04
653		TEXTILE FABRICS,WOVEN OTHER THAN COTTON	0.054	0.010	-99.12	-99.61	0.03	0.01
654		TULLE,LACE,EMBROIDERY,RIBBONS ETC.	0.000	0.004	-99.93	-99.05	0.00	0.03
655		SPECIAL TEXTILE FABRICS & REL. PRODUCTS	0.134	0.016	-83.18	-98.10	0.27	0.04
656		MADE-UP ARTICLES,CHIEFLY OF TEXTILES	0.000	0.041	-99.99	-91.33	0.00	0.14
657		FLOOR COVERING,TAPESTRIES ETC.	0.149	0.163	-4.12	-23.58	0.41	0.43
682		COPPER	0.039	0.000	-99.36	-99.99	0.01	0.00
687		TIN	11.259	7.709	99.13	99.33	47.91	40.93
698		MANUFACTURE OF METALS N.E.S.	1.115	0.071	-62.73	-95.82	1.29	0.08
735		SHIPS AND BOATS	0.017	0.018	-99.52	-99.47	0.01	0.01
841		CLOTHING EXCEPT FUR CLOTHING	0.001	0.565	-99.90	-29.80	0.00	0.23
851		FOOTWEAR	0.046	0.338	-68.11	-97.18	0.05	0.01
892		PRINTED MATTER	0.011	1.636	-98.84	36.78	0.01	2.31
897		JEWELLERY,GOLD AND SILVER WARES	0.121	0.004	-41.51	-88.06	0.49	0.01
899		MANUFACTURED ARTICLES,N.E.S.	0.002	0.205	-99.92	-75.57	0.00	0.49

Source: UNIDO Changing Patterns of Trade in World Industry, An Empirical Study on Revealed Comparative Advantage, 1982.

a/ SITC 061 only.

Indonesia: Import[a/] and Domestic Production of Manufactured Goods by End Use 1967-1980
(Billion Rupiahs, Current Prices and Percentage Shares)

	1967				1971				1975				1980			
	Imports		Prod.*		Imports		Prod.		Imports		Prod.		Imports		Prod.	
	Bill. Rp.	(%)	Bill. Rp.	(%)	Bill. Rp.	(%)	Bill. Rp.	(%)	Bill. Rp.	(%)	Bill. Rp.	(%)	Bill. Rp.	(%)	Bill. Rp.	(%)
Mainly Consumer Goods[b/]	13.72	(9.6)	-	-	37.87	(9.6)	311.17	(81.7)	215.74	(11.5)	1,055.80	(70.6)	831.80	(14.2)	3,422.50	(52.1)
Mainly Intermed. Goods[c/]	87.42	(61.2)	-	-	190.82	(48.4)	47.90	(12.6)	918.00	(49.1)	262.50	(17.6)	2,745.35	(46.9)	1,990.90	(30.3)
Mainly Capital Goods[d/e/]	41.60	(29.2)	-	-	165.81	(42.0)	21.60	(5.7)	735.76	(39.4)	177.00	(11.8)	2,277.50	(38.9)	1,159.40	(17.6)
Total Manufactured Goods	142.74	(100.0)	-	-	394.50	(100.0)	380.67	(100.0)	1,869.50	(100.0)	1,495.30	(100.0)	5,845.65	(100.0)	6,572.80	(100.0)

Source: UNIDO Data Base.

* Not Available.

a/ Exchange rates used: 1967 235.00
1971 378.00
1975 415.00
1980 626.75

b/ ISIC 3110, 3130, 3140, 3210, 3220, 3240, 3320, 3420, 3610, 3900.

c/ ISIC 3230, 3310, 3410, 3510, 3520, 3530, 3540, 3550, 3560, 3620, 3690, 3710, 3720.

d/ ISIC 3810, 3820, 3830, 3840, 3850.

e/ Includes also some consumer durables.

INDONESIA

ORIGIN OF IMPORTS OF MANUFACTURES BY BRANCHES; 1980 a/

SITC	DESCRIPTION OF TRADE GOODS	WORLD TOTAL (1000 US$)	DEVELOPING COUNTRIES (PERCENT)	DEVELOPED MARKET ECONOMIES TOTAL (PERCENT)	USA (PERCENT)	EEC (PERCENT)	JAPAN (PERCENT)	CENTRALLY PLANNED DEVELOPED COUNTRIES (PERCENT)
01	MEAT AND MEAT PREPARATIONS	5581	48.70	51.03	16.19	4.27	1.09	0.04
02	DAIRY PRODUCTS AND EGGS	80080	0.93	97.46	3.50	16.10	0.38	1.61
032	FISH N.E.S. AND FISH PREPARATIONS	2815	15.29	84.69	6.18	0.36	55.14	0.00
0422	RICE,GLAZED OR POLISHED NOT OTHERWISE WORKED	690424	62.03	25.84	12.27	0.00	11.27	0.00
046	MEAL AND FLOUR OF WHEAT OR OF MESLIN	5714	0.12	99.88	99.85	0.00	0.00	0.00
047	MEAL AND FLOUR OF CEREALS,EXCEPT ABOVE	52	54.83	45.17	15.15	25.47	0.00	0.00
048	CEREALS PREPARAT. & STARCH OF FRUITS & VEGETAB.	6644	19.69	80.09	5.54	9.87	0.98	0.01
052	DRIED FRUIT	1549	85.70	14.26	7.74	0.01	0.00	0.00
053	FRUIT,PRESERVED AND FRUIT PREPARATIONS	4793	30.51	47.48	37.10	3.58	2.25	0.08
055	VEGETABLES,ROOTS & TUBERS,PRESERVED OR PREPARED	15063	47.57	4.47	2.50	0.51	0.56	0.00
06	SUGAR,SUGAR PREPARATIONS AND HONEY	163368	88.14	4.84	0.18	1.24	3.15	0.01
0713	COFFEE EXTRACTS,ESSENCES,CONCENTRATES & SIMILAR	198	8.97	91.03	58.63	4.66	27.59	0.00
0722	COCOA POWDER,UNSWEETENED	1661	61.64	38.36	0.68	37.56	0.00	0.00
0723	COCOA BUTTER AND COCOA PASTE	9	4.88	95.12	22.64	2.40	34.36	0.00
073	CHOCOLATE AND RELATED FOOD PREPARATIONS	508	16.34	83.23	24.80	43.10	3.28	0.43
074	TEA AND MATE	162	82.06	17.94	9.31	5.46	2.45	0.00
081	FEEDING-STUFF FOR ANIMALS	38313	93.12	6.78	4.65	0.74	1.08	0.00
09	MISCELLANEOUS FOOD PREPARATIONS	8174	19.71	79.96	26.85	31.73	5.92	0.05
11	BEVERAGES	10145	31.67	68.07	7.65	54.80	1.40	0.14
122	TOBACCO MANUFACTURES	5297	0.90	99.10	21.03	74.47	1.70	0.00
2219	FLOUR AND MEAL OF OIL SEEDS,NUTS,KERNELS	219	16.77	33.96	0.92	32.41	0.50	0.00
231	CRUDE RUBBER,SYNTH. & RECLAIMED(EXCL.SITC 2311)	19558	1.46	92.24	11.51	6.90	73.74	0.25
243	WOOD,SHAPED OR SIMPLY WORKED	22	99.71	0.29	0.29	0.00	0.00	0.00
251	PULP AND WASTE PAPER	62766	11.02	63.08	19.04	1.36	3.81	0.07
2626	WOOL SHODDY	6	0.00	100.00	0.00	65.45	0.00	0.00
2628	WOOL TOPS	1311	0.00	100.00	0.00	0.00	0.00	0.00
2629	WASTE OF WOOL AND OTHER ANIMAL HAIR N.E.S.	2	100.00	0.00	0.00	0.00	0.00	0.00
263	COTTON	190886	17.22	73.95	69.65	0.54	0.12	8.04
266	SYNTHETIC AND REGENERATED(ARTIFICIAL) FIBRES	95252	12.48	75.37	10.52	4.66	50.66	0.06
267	WASTE MATERIALS FROM TEXTILE FABRICS(INCL.RAGS)	2381	13.49	84.97	45.31	13.65	19.52	0.19
332	PETROLEUM PRODUCTS	692224	92.30	7.35	3.88	1.30	1.50	0.00
4	ANIMAL AND VEGETABLE OILS AND FATS	8846	13.83	84.76	4.41	30.35	32.82	0.00
411	ANIMAL OILS AND FATS	74		81.61	12.45	32.65	1.36	0.00
421	FIXED VEGETABLE OILS,SOFT(INCL.SITC 422)	[illegible]		[illegible]	28.44	23.39	2.59	0.00
431	ANIMAL AND VEGETABLE OILS AND FATS PROCESSED	[illegible]			0.73	30.94	39.66	0.00

(Annex Table 25 continued)

INDONESIA

ORIGIN OF IMPORTS OF MANUFACTURES BY BRANCHES, 1980 a/

SITC	DESCRIPTION OF TRADE GOODS	WORLD TOTAL (1000 US$)	DEVELOPING COUNTRIES (PERCENT)	DEVELOPED MARKET ECONOMIES TOTAL (PERCENT)	USA (PERCENT)	EEC (PERCENT)	JAPAN (PERCENT)	CENTRALLY PLANNED DEVELOPED COUNTRIES (PERCENT)
5	CHEMICALS	1255020	12.68	82.36	21.65	25.19	28.41	1.28
51	CHEMICALS ELEMENTS AND COMPOUNDS	515953	14.26	80.98	17.90	22.56	34.55	1.48
52	TAR AND CHEMICALS FROM COAL, PETROLEUM, NAT. GAS	837	26.42	72.04	18.82	39.62	12.25	0.00
53	DYEING, TANNING AND COLOURING MATERIALS	97439	10.45	85.67	2.72	39.31	25.93	2.06
54	MEDICINAL AND PHARMACEUTICAL PRODUCTS	79871	12.15	86.08	21.48	43.22	9.17	1.03
55	ESSENTIAL OILS AND PERFUME MATERIALS	40740	15.30	81.40	13.59	34.90	26.52	0.10
56	FERTILIZERS, MANUFACTURED	71915	24.28	71.39	12.40	40.85	7.61	3.16
57	EXPLOSIVES AND PYROTECHNIC PRODUCTS	9120	1.08	91.89	8.32	59.28	22.01	0.00
58	PLASTIC MATERIALS, REGENERATED CELLUL. & RESINS	305400	8.27	84.34	33.56	13.39	33.38	1.01
59	CHEMICAL MATERIALS AND PRODUCTS N.E.S.	133744	12.13	84.11	31.22	27.41	18.99	0.13
6	MANUFACTURED GOODS CLASSIFIED BY MATERIAL	2053326	18.45	76.11	7.59	10.22	47.16	1.02
61	LEATHER MANUFACTURES N.E.S. & DRESSED FUR SKINS	1313	19.24	54.22	9.70	21.67	18.91	1.35
62	RUBBER MANUFACTURES N.E.S.	56614	18.59	76.26	14.74	20.27	36.64	0.01
63	WOOD AND CORK MANUFACTURES(EXCL.FURNITURE)	3378	37.50	58.62	26.58	4.54	20.40	1.09
64	PAPER, PAPER BOARD AND MANUFACTURES THEREOF	171866	12.42	85.13	10.29	19.72	15.63	0.50
65	TEXTILE YARN, FABRICS, MADE-UP ARTICLES	216975	37.43	44.63	4.75	2.38	36.67	0.02
66	NON-METALLIC MINERAL MANUFACTURES, N.E.S.	126362	20.62	72.35	6.91	19.84	34.89	2.10
67	IRON AND STEEL	966700	17.45	78.97	6.64	5.59	60.82	1.01
68	NON-FERROUS METALS	194025	14.09	81.09	4.85	8.35	31.11	1.72
69	MANUFACTURES OF METAL, N.E.S.	316075	13.31	82.78	11.43	20.10	46.76	1.34
7	MACHINERY AND TRANSPORT EQUIPMENT	3633821	5.45	90.65	13.51	21.95	49.63	0.38
71	MACHINERY, OTHER THAN ELECTRIC	1855004	6.74	89.29	18.38	21.24	41.24	0.34
72	ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES	748641	5.42	88.29	11.56	29.99	43.12	0.40
73	TRANSPORT EQUIPMENT	1030176	3.14	94.82	6.16	17.38	69.47	0.42
8	MISCELLANEOUS MANUFACTURED ARTICLES	285192	13.76	77.31	17.69	19.39	36.56	0.20
81	SANITARY, PLUMBING, HEATING & LIGHTING FIXTURES	13007	23.33	69.63	10.40	34.44	21.59	0.36
82	FURNITURE	8581	44.24	39.67	9.54	13.08	13.20	0.27
83	TRAVEL GOODS, HANDBAGS AND SIMILAR ARTICLES	1517	29.37	10.28	3.10	2.70	3.64	0.00
84	CLOTHING	3095	26.95	61.47	24.49	5.23	15.56	0.12
85	FOOTWEAR	2376	19.18	65.40	16.76	19.04	12.58	0.42
86	PROFESSIONAL, SCIENT. & CONTROLL. INSTRUMENTS	132299	6.73	89.58	23.30	24.84	37.30	0.22
89	MISCELLANEOUS MANUFACTURED ARTICLES, N.E.S.	124317	17.51	69.09	13.06	13.02	40.34	0.17
	TOTAL MANUFACTURES	9341385	22.45	72.26	13.46	15.28	36.37	0.73
	TOTAL: SITC 5-8 LESS 68 b/	7033334	10.63	84.65	13.64	19.37	45.10	0.68
	TOTAL TRADED GOODS: SITC 0-9	10034394	30.25	65.02	13.01	13.33	31.50	0.63

NOTE: DATA AND SITC DESCRIPTIONS REFER TO SITC REVISION 1

a/ THIS TABLE IS BASED ON THE DEFINITION OF TRADE IN MANUFACTURES COVERING A LIST OF 148 SPECIFICALLY IDENTIFIED SITC 3-DIGIT OR 4-DIGIT CODES COMPRISING A WIDE RANGE OF PROCESSING STAGES OF MANUFACTURED GOODS.

b/ DEFINITION OF TRADE IN MANUFACTURES SITC 5-8 LESS 68 IS ONE OF THE MOST OFTEN FOUND. IT COVERS ONLY ITEMS RECOGNIZED AS EXCLUSIVELY MANUFACTURED GOODS, I.E. WITH A HIGH LEVEL OF MANUFACTURING CONTENT.

SOURCE: UNIDO DATA BASE; INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE.

INDONESIA

DESTINATION OF EXPORTS OF MANUFACTURES BY BRANCHES, 1980 a/

SITC	DESCRIPTION OF TRADE GOODS	WORLD TOTAL (1000 US$)	DEVELOPING COUNTRIES (PERCENT)	DEVELOPED MARKET ECONOMIES TOTAL (PERCENT)	DEVELOPED MARKET ECONOMIES USA (PERCENT)	DEVELOPED MARKET ECONOMIES EEC (PERCENT)	DEVELOPED MARKET ECONOMIES JAPAN (PERCENT)	CENTRALLY PLANNED DEVELOPED COUNTRIES (PERCENT)
01	MEAT AND MEAT PREPARATIONS	4779	4.46	95.54	0.00	95.54	0.00	0.00
02	DAIRY PRODUCTS AND EGGS	603	99.14	0.86	0.01	0.69	0.00	0.00
032	FISH N.E.S. AND FISH PREPARATIONS	502	1.39	98.61	0.00	20.51	78.10	0.00
0422	RICE,GLAZED OR POLISHED NOT OTHERWISE WORKED	3043	99.91	0.09	0.00	0.09	0.00	0.00
048	CEREALS PREPARAT. & STARCH OF FRUITS & VEGETAB.	4001	12.41	87.59	0.13	39.12	47.99	0.00
052	DRIED FRUIT	67	95.02	4.98	0.00	4.98	0.00	0.00
053	FRUIT,PRESERVED AND FRUIT PREPARATIONS	4183	73.85	26.15	0.01	23.30	1.30	0.00
055	VEGETABLES,ROOTS & TUBERS,PRESERVED OR PREPARED	3735	12.50	65.01	0.00	0.79	65.03	0.00
06	SUGAR,SUGAR PREPARATIONS AND HONEY	22976	42.78	44.53	0.00	0.00	44.53	0.00
0713	COFFEE EXTRACTS,ESSENCES,CONCENTRATES & SIMILAR	2324	15.85	84.15	0.00	0.00	84.15	0.00
0722	COCOA POWDER,UNSWEETENED	18077	99.74	0.26	0.00	0.00	0.26	0.00
0723	COCOA BUTTER AND COCOA PASTE	1504	100.00	0.00	0.00	0.00	0.00	0.00
074	TEA AND MATE	112669	45.72	54.28	18.08	17.29	0.24	0.00
081	FEEDING-STUFF FOR ANIMALS	104312	18.44	79.66	0.00	72.14	6.58	1.39
09	MISCELLANEOUS FOOD PREPARATIONS	2541	39.22	58.76	11.31	40.98	0.01	0.00
11	BEVERAGES	359	7.43	85.35	28.98	50.76	5.61	0.00
122	TOBACCO MANUFACTURES	1450	62.39	37.61	30.06	0.18	0.00	0.00
231	CRUDE RUBBER,SYNTH. & RECLAIMED(EXCL.SITC 2311)	0	0.00	0.00	0.00	0.00	0.00	0.00
243	WOOD,SHAPED OR SIMPLY WORKED	253202	36.98	56.94	1.20	42.71	10.17	0.09
263	COTTON	4	0.00	100.00	0.00	0.00	100.00	0.00
266	SYNTHETIC AND REGENERATED(ARTIFICIAL) FIBRES	46	0.00	100.00	0.00	0.00	100.00	0.00
267	WASTE MATERIALS FROM TEXTILE FABRICS(INCL.RAGS)	58	3.35	96.65	0.00	0.00	96.65	0.00
332	PETROLEUM PRODUCTS	1187458	4.33	95.30	12.35	1.49	80.89	0.00
4	ANIMAL AND VEGETABLE OILS AND FATS	284805	33.20	66.32	7.08	54.71	2.62	0.00
411	ANIMAL OILS AND FATS	132	48.88	51.12	0.00	0.06	51.06	0.00
421	FIXED VEGETABLE OILS,SOFT(INCL.SITC 422)	279871	32.63	67.37	7.20	55.65	2.57	0.00
431	ANIMAL AND VEGETABLE OILS AND FATS PROCESSED	4801	66.18	5.70	0.00	1.59	4.11	0.00

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Annex Table 26

INDONESIA
TABLE 93. DESTINATION OF EXPORTS OF MANUFACTURES BY BRANCHES, 1980 a/

SITC	DESCRIPTION OF TRADE GOODS	WORLD TOTAL (1000 US$)	DEVELOPING COUNTRIES (PERCENT)	DEVELOPED MARKET ECONOMIES TOTAL (PERCENT)	USA (PERCENT)	EEC (PERCENT)	JAPAN (PERCENT)	CENTRALLY PLANNED DEVELOPED COUNTRIES (PERCENT)
5	CHEMICALS	63805	57.34	42.03	14.55	15.67	8.81	0.00
51	CHEMICALS ELEMENTS AND COMPOUNDS	12322	27.16	70.83	2.70	9.37	55.73	0.00
52	TAR AND CHEMICALS FROM COAL,PETROLEUM,NAT. GAS	1679	100.00	0.00	0.00	0.00	0.00	0.00
53	DYEING,TANNING AND COLOURING MATERIALS	1540	58.76	41.24	0.83	35.82	2.94	0.00
54	MEDICINAL AND PHARMACEUTICAL PRODUCTS	11668	47.83	52.17	14.60	32.29	0.00	0.00
55	ESSENTIAL OILS AND PERFUME MATERIALS	21571	9.91	89.90	46.93	35.52	2.06	0.00
56	FERTILIZERS MANUFACTURED	34892	98.43	1.57	0.00	0.00	0.00	0.00
58	PLASTIC MATERIALS,REGENERATED CELLUL. & RESINS	29	14.62	0.08	0.00	0.00	0.08	0.00
59	CHEMICAL MATERIALS AND PRODUCTS N.E.S.	105	54.34	29.04	0.00	0.03	29.01	0.00
6	MANUFACTURED GOODS CLASSIFIED BY MATERIAL	614700	42.86	54.36	1.68	33.83	18.09	1.76
61	LEATHER MANUFACTURES N.E.S. & DRESSED FUR SKINS	6909	23.96	75.05	2.44	7.24	64.09	0.10
62	RUBBER MANUFACTURES N.E.S.	432	53.04	46.96	0.00	0.00	0.05	0.00
63	WOOD AND CORK MANUFACTURES(EXCL.FURNITURE)	73519	59.66	38.25	13.03	11.60	13.29	0.04
64	PAPER,PAPER BOARD AND MANUFACTURES THEREOF	4734	95.61	4.39	0.00	0.06	0.00	0.00
65	TEXTILE YARN,FABRICS,MADE-UP ARTICLES	45828	62.53	36.30	2.86	11.24	17.36	0.02
66	NON-METALLIC MINERAL MANUFACTURES,N.E.S.	31901	88.01	11.99	0.00	0.00	10.40	0.00
67	IRON AND STEEL	18776	70.09	21.48	0.00	0.00	21.48	0.00
68	NON-FERROUS METALS	427072	32.88	64.60	0.11	45.36	19.13	2.52
69	MANUFACTURES OF METAL,N.E.S.	5526	51.55	0.64	0.02	0.46	0.15	0.00
7	MACHINERY AND TRANSPORT EQUIPMENT	163762	95.32	4.61	0.09	3.47	0.86	0.04
71	MACHINERY,OTHER THAN ELECTRIC	4095	94.71	4.23	0.24	1.15	2.19	1.06
72	ELECTRICAL MACHINERY,APPARATUS AND APPLIANCES	97143	98.61	1.39	0.08	0.53	0.76	0.00
73	TRANSPORT EQUIPMENT	7724	54.32	45.26	0.20	41.74	1.40	0.00
8	MISCELLANEOUS MANUFACTURED ARTICLES	120242	43.29	56.41	7.46	36.65	3.29	0.00
81	SANITARY,PLUMBING,HEATING & LIGHTING FIXTURES	250	98.31	1.69	1.56	0.05	0.00	0.00
82	FURNITURE	3111	8.38	91.62	1.56	18.70	32.16	0.00
83	TRAVEL GOODS,HANDBAGS AND SIMILAR ARTICLES	556	7.67	92.28	0.41	74.96	11.66	0.00
84	CLOTHING	98274	45.67	54.31	7.56	37.86	0.72	0.00
85	FOOTWEAR	1450	32.88	67.11	16.04	4.93	17.93	0.00
86	PROFESSIONAL,SCIENT. & CONTROLL. INSTRUMENTS	3766	79.56	20.42	0.03	0.09	19.83	0.00
89	MISCELLANEOUS MANUFACTURED ARTICLES,N.E.S.	12841	24.54	72.80	9.82	45.06	9.17	0.00
	TOTAL MANUFACTURES	2940488	27.80	70.67	7.61	22.24	38.82	0.43
	TOTAL: SITC 5-8 LESS 68 b/	500836	65.31	33.22	6.46	15.02	8.35	0.02
	TOTAL TRADED GOODS: SITC 0-9	21708898	19.92	77.75	19.64	6.33	49.26	0.65

NOTE: DATA AND SITC DESCRIPTIONS REFER TO SITC REVISION 1
a/ THIS TABLE IS BASED ON THE DEFINITION OF TRADE IN MANUFACTURES COVERING A LIST OF 140 SPECIFICALLY IDENTIFIED SITC 3-DIGIT OR 4-DIGIT CODES COMPRISING A WIDE RANGE OF PROCESSING STAGES OF MANUFACTURED GOODS.
b/ DEFINITION OF TRADE IN MANUFACTURES SITC 5-8 LESS 68 IS ONE OF THE MOST OFTEN FOUND.
IT COVERS ONLY ITEMS RECOGNIZED AS EXCLUSIVELY MANUFACTURED GOODS,I.E. WITH A HIGH LEVEL OF MANUFACTURING CONTENT.
SOURCE: UNIDO DATA BASE;INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE.

Annex Table 27

INDONESIA

SHARES OF EXPORTS AND IMPORTS CLASSIFIED ACCORDING TO LEVEL OF PROCESSING 1970 AND 1980
AND TREND GROWTH RATES 1970-1975 AND 1975-1980

CLASSES	EXPORTS				IMPORTS			
	CLASS SHARE OF TOTAL (PERCENTAGE)		CLASS GROWTH RATE (PERCENTAGE)		CLASS SHARE OF TOTAL (PERCENTAGE)		CLASS GROWTH RATE (PERCENTAGE)	
	1970	1980	1970-1975	1975-1980	1970	1980	1970-1975	1975-1980
A : NON-PROCESSED GOODS FOR FURTHER PROCESSING	85.58	72.13	56.74	19.01	0.00	13.81	66.57	45.21
B : PROCESSED GOODS FOR FURTHER PROCESSING	6.59	5.32	45.66	34.28	0.00	16.08	40.37	24.48
C : NON-PROCESSED GOODS FOR FINAL USE	3.18	15.04	36.62	83.39	0.00	0.82	11.15	5.57
D : PROCESSED GOODS FOR FINAL USE	4.65	7.52	74.51	27.30	0.00	69.28	49.18	10.69
	1970		1980		1970		1980	
SUM OF CLASSES: A+B+C+D IN 1000 CURRENT US$	1054739		21908890		0		10834394	
TOTAL TRADE SITC 0-9 IN 1000 CURRENT US$	1055090		21908890		0		10834394	

SOURCE: UNIDO DATA BASE; INFORMATION SUPPLIED BY THE UNITED NATIONS STATISTICAL OFFICE, WITH ESTIMATES BY THE UNIDO SECRETARIAT.

NOTE: CALCULATIONS ARE BASED ON CURRENT US DOLLAR PRICES.
SUM OF CLASSES AND TOTAL TRADE FIGURES SHOULD BE IDENTICAL. DISCREPANCIES OR ZERO VALUES ARE DUE TO LACK OF COUNTRYS" TRADE REPORTING IN GENERAL; BUT ESPECIALLY AT THE 3-,4- AND 5-DIGIT SITC LEVEL.

Annex Table 28

Employment and GDP at constant market prices, by sector, 1971 and 1980.

	Employment ('000)		GDP at constant 1973 market prices (Rp. billion)	
Sector	1971	1980	1971	1980
Agriculture, forestry fishery	24,963	28,834	2,441	3,425
Mining and quarrying	91	387	551	1,035
Manufacturing	2,950	4,680	490	1,705
Electricity, gas, water	38	66	25	78
Construction	741	1,657	171	639
Trade, banking, insurance	4,230	6,981	988	2,060
Transport, storage, communication	919	1,468	210	609
Other services	3,940	7,166	669	1,619
Unclassified	--	313		
All Sectors	39,474	51,553	5,545	11,169

Note: Totals do not add due to rounding.
The 1971 employment data are based on the C series of the 1971 population census. These estimates are considered best comparable with the results of the 1980 population census. The final results of the 1971 census give lower employment estimates, especially for manufacturing and would therefore lead to higher growth rates over the period 1971 to 1980.

Source: BPS, various publications.

Annex Table 29

Sectoral shares in employment and GDP at constant 1973 market prices and compound annual rates of increase in sectoral employment, gross value added at constant 1973 market prices and labour productivity; 1971-1980

Sector	Sectoral Shares (%)				Compound annual increase over 1971-1980 (%)		
	Employment		GDP at constant 1973 market prices				
	1971	1980	1971	1980	Employment 1/	Labour productivity 2/	Real production 2/
Agriculture, forestry fishery	65.9	56.3	44.0	30.7	1.6	2.2	3.8
Mining and quarrying	0.2	0.8	9.9	9.3	17.4	-8.4	7.3
Manufacturing	7.8	9.1	8.8	15.3	5.3	9.1	14.9
Electricity, gas, water	0.1	0.1	0.5	0.7	6.3	6.7	13.5
Construction	2.0	3.2	3.1	5.7	9.4	5.9	15.8
Trade, banking, insurance	11.2	13.6	17.8	18.4	5.7	2.6	8.5
Transport, storage, communication	2.4	2.9	3.8	5.4	5.3	6.9	12.6
Other services	10.4	14.0	12.1	14.5	6.9	3.2	10.3
All sectors	100.0	100.0	100.0	100.0	3.0	4.9	8.1

Source: BPS, various publications.

1/ In the calculation of the growth rates the category unclassified for 1971 was distributed proportionally among the different sectors.

2/ At constant 1973 market prices.

Annex Table 30

Manufactured exports in major East Asian Countries
(US $ million — and percentage shares)

SITC	Commodity	Korea 1967	Korea 1975	Phillipines 1967	Phillipines 1975	Thailand 1967	Thailand 1975	Malaysia 1967	Malaysia 1975	Indonesia 1967	Indonesia 1975
		A. US $ Million									
	Total manufactured goods[a/]	221.0	4,255.9	73.9	371.0	50.9	582.6	100.0	933.4	16.6	135.0
0	Manufactured food	4.2	102.7	14.6	80.7	28.1	68.4	23.1	58.9	1.7	4.6
	Fish airtight containers	2.6	37.6	0.0	0.9	0.0	1.0	0.8	10.3		0.0
	Meal and flour of wheat	-	0.0	-	-	0.6	0.1	3.3	0.0	-	0.3
	Meal and flour of cereals	0.0	0.0	-	0.0	4.5	9.3	0.0	0.0	-	0.1
	Cereals preparation	0.3	4.4	0.0	0.9	0.6	1.7	0.9	5.2	-	0.6
	Dried fruit	0.0	0.1	-	30.4	0.0	2.9	0.0	0.1	0.1	0.0
	Fruit, preserved and prepared	0.0	1.6	13.2	45.1	0.3	18.2	14.5	24.8	0.0	0.8
	Vegetable, roots, tubers	1.2	27.9	0.0	0.5	21.8	23.6	1.7	6.1	1.2	0.1
	Cocoa butter and paste	-	-	1.0	-	-	-	-	0.5	-	1.0
	Miscellaneous food production	0.0	23.4	0.2	1.1	0.2	2.5	1.4	10.3	0.3	1.1
1	Manufactured beverages/tobacco	0.4	1.3	2.5	2.1	0.1	0.5	3.2	11.0	0.1	13.5
	Alcoholic beverages	0.4	1.1	2.1	1.3	0.1	0.4	2.9	3.9	0.1	0.2
	Tobacco manufactured	0.0	0.2	0.5	0.7	0.0	0.1	0.3	6.8	0.1	13.4
2	Manufactured crude materials	2.9	25.1	6.4	29.4	6.9	27.4	23.1	184.0	0.7	31.5
	Wood shaped/simply worked	2.7	15.9	6.4	27.2	6.9	27.2	23.1	183.6	0.7	31.5
	Plup/waste paper	-	0.0	-	2.0	-	-	0.0	0.2	-	-
4	Manufactured animal and vegetable (oils and fats)	0.1	0.6	0.0	1.0	0.0	0.1	0.1	15.1	0.2	0.0
	Animal/vegetable oil/fats	0.1	0.6	0.0	1.0	0.0	0.1	0.1	15.1	0.2	0.0
5	Chemicals	2.4	74.6	4.6	21.2	0.8	12.0	13.1	33.1	1.9	24.3
	Organic chemicals	0.3	31.5	1.3	5.3	0.1	1.5	1.0	2.7	-	1.1
	Inorganic chemicals	0.1	9.6	1.4	0.9	0.0	0.5	0.3	2.8	-	0.7
	Dyeing and colour materials	0.1	2.6	0.2	1.0	0.0	0.4	2.6	1.0	0.1	0.1
	Medical/pharmaceuticals	0.1	9.7	1.0	2.2	0.4	4.9	2.0	7.2	0.0	12.4
	Plastic materials	0.0	8.8	-	4.4	-	3.1	0.1	4.5	-	0.0
	Other chemicals	0.0	12.4	0.1	7.3	0.2	1.6	6.8	13.0	1.7	9.7

SITC	Commodity	Korea 1967	Korea 1975	Philippines 1967	Philippines 1975	Thailand 1967	Thailand 1975	Malaysia 1967	Malaysia 1975	Indonesia 1967	Indonesia 1975
		(US $ Mill.)									
6	Manufactured goods	99.6	1,471.1	41.2	119.8	12.5	195.6	23.4	171.9	1.2	8.1
	Leather	-	0.7	-	0.0	0.2	2.4	0.0	0.1	0.1	0.4
	Rubber manufactured	2.0	90.9	0.4	0.7	0.1	3.0	4.7	18.1	-	0.2
	Wood and cork manufactures	36.6	227.5	35.9	59.8	0.8	22.7	4.2	85.6	0.1	1.1
	Paper and manufactures	1.8	36.8	0.1	0.7	0.0	4.2	1.0	3.5	0.0	0.3
	Textile, yarn and threads	3.1	205.0	0.1	4.3	0.1	9.6	0.6	5.3	-	0.0
	Cotton fabrics	12.6	50.5	0.2	1.7	0.3	17.1	3.1	20.0	0.5	0.4
	Textile fabrics (no cotton)	19.5	271.7	0.2	0.6	2.2	27.2	0.0	4.0	0.1	0.1
	Building materials	0.4	73.1	0.0	27.2	0.8	25.9	4.1	3.3	-	0.0
	Glass/glassware	0.5	7.9	0.2	1.9	0.2	1.0	0.1	2.7	-	-
	Pearls, semi-precious	0.0	1.6	-	-	4.5	38.7	-	0.2	0.0	0.3
	Iron and steel ingots	0.2	34.6	-	0.2	-	-	0.0	0.1	-	-
	Iron and steel bars	0.2	46.5	-	0.0	0.0	0.1	0.0	0.9	-	0.1
	Iron and steel plates	1.0	74.3	0.0	0.0	0.1	0.8	1.2	1.0	-	0.0
	Iron and steel tubes	0.2	59.5	-	0.7	0.3	4.1	0.8	2.8	-	0.2
	Tools	0.5	6.3	-	0.2	0.0	1.2	0.1	0.7	-	1.8
	Other manufactured goods	20.4	260.4	4.1	19.9	2.8	35.3	2.7	19.0	0.4	3.0
7	Machinery and transport equipment	14.2	700.7	0.7	12.8	0.5	28.5	3.9	238.8	10.4	32.1
	Power generating machinery	1.0	2.4	-	0.0	0.0	0.2	0.0	6.7	-	8.0
	Office machines	0.0	44.1	-	0.0	-	0.4	0.0	31.9	-	0.3
	Electrical machinery	7.4	440.9	0.0	5.3	0.4	23.3	2.3	126.6	-	12.9
	Road motor vehicles	0.9	3.4	0.0	1.6	0.1	1.0	0.1	12.8	-	0.2
	Aircraft	0.5	14.3	-	0.0	-	0.0	0.0	10.1	-	3.0
	Ships and boats	1.3	137.8	0.6	1.2	0.0	0.0	0.0	3.2	-	1.1
	Other machinery and equipment	2.9	36.7	0.1	4.6	0.1	3.4	1.3	45.4	10.4	6.5
8	Miscellaneous manufactured articles	97.2	1,879.7	2.7	104.1	1.9	250.2	10.2	220.6	0.3	20.9
	Furniture	0.1	10.8	6.6	5.2	0.0	3.1	1.3	4.0	-	0.2
	Clothing and textile fabrics	59.2	1,131.6	0.3	33.1	0.9	53.5	3.2	42.2	-	2.4
	Footwear	8.1	191.2	0.2	3.0	0.0	0.7	1.8	14.7	-	0.2
	Scientific and medical instruments	0.3	23.0	-	0.8	0.0	1.5	0.1	136.1	-	2.6
	Watches and clocks	0.1	43.0	-	0.1	-	3.1	0.0	2.9	-	0.0
	Sound recording and medical instruments	0.1	83.2	0.0	1.4	0.0	0.1	0.5	3.0	-	0.4
	Printed matter	0.5	16.3	0.1	0.4	0.0	169.0	1.2	2.6	0.1	8.4
	Toys, sporting games	0.8	69.0	0.0	-	0.1	0.7	0.1	1.0	-	0.1
	Others	27.6	293.5	1.5	58.3	0.8	17.5	1.9	12.5	0.3	6.4

SITC	Commodity	Korea 1967	Korea 1975	Philippines 1967	Philippines 1975	Thailand 1967	Thailand 1975	Malaysia 1967	Malaysia 1975	Indonesia 1967	Indonesia 1975
					B. Percentage Share						
	Total manufactured goods[a/]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0	Manufactured food	1.9	2.4	20.0	21.7	55.2	11.7	23.1	6.3	10.2	3.4
	Fish air-tight containers	1.2	0.9	0.0	0.2	0.0	1.7	0.8	1.1	1.2	0.0
	Meal and flour of wheat	–	0.0	–	–	1.2	0.0	3.3	0.0	–	0.2
	Meal and flour of cereals	0.0	0.0	–	0.0	8.8	1.6	0.0	0.0	–	0.1
	Cereals preparation	0.2	0.1	0.0	0.2	1.2	0.3	0.9	0.6	–	0.4
	Dried fruit	0.0	0.0	–	8.2	0.0	0.5	0.0	0.0	0.5	0.0
	Fruit, preserved and prepared	0.0	0.0	18.2	12.2	0.6	3.1	14.5	2.7	0.0	0.6
	Vegetables, roots, tubers	0.5	0.7	0.0	0.1	42.9	4.0	1.7	0.7	7.3	0.1
	Cocoa butter and paste	–	–	1.4	–	–	–	–	0.1	–	0.8
	Miscellaneous food production	0.0	0.6	0.3	0.3	0.5	0.4	1.4	1.1	1.2	0.8
1	Manufactured beverages/tobacco	0.2	0.0	3.5	0.6	0.3	0.1	3.2	1.2	0.9	10.0
	Alcoholic beverages	0.2	0.0	2.8	0.4	0.3	0.1	2.9	0.4	0.4	0.1
	Tobacco manufactured	0.0	0.0	0.6	0.2	0.0	0.0	0.3	0.7	0.5	9.9
2	Manufactured crude materials	1.3	0.6	8.8	7.9	13.5	4.7	23.1	19.7	4.3	23.4
	Wood shaped/simply worked	1.2	0.4	8.8	7.3	13.5	4.7	23.1	19.7	4.3	23.4
	Pulp/waste paper	–	0.0	–	0.5	–	–	0.0	0.0	–	–
4	Manufactured animal and vegetable (oils and fats)	0.0	0.0	0.1	0.3	0.0	0.0	0.1	1.6	1.2	0.0
	Animal/vegetable oils/fats	0.0	0.0	0.1	0.3	0.0	0.0	0.1	1.6	1.2	0.0
5	Chemicals	1.1	1.8	6.3	5.7	1.6	2.1	13.1	3.5	11.5	18.0
	Organic chemicals	0.1	0.7	1.9	1.4	0.3	0.3	1.0	0.3	–	0.8
	Inorganic chemicals	0.1	0.2	1.9	0.3	0.1	0.1	0.3	0.3	–	0.5
	Dyeing + color materials	0.1	0.1	0.3	0.3	0.0	0.1	2.6	0.1	0.9	0.1
	Medical/pharmaceuticals	0.1	0.2	1.4	0.6	0.8	0.8	2.0	0.8	0.2	9.2
	Plastic materials	0.0	0.2	–	1.2	–	0.5	0.1	0.5	–	0.0
	Other chemicals	0.0	0.3	0.2	2.0	0.4	0.3	6.8	1.4	10.5	7.2
6	Manufactured goods	45.1	34.6	56.6	32.3	24.6	33.6	23.4	18.4	7.2	6.0
	Leather	–	0.0	–	0.0	0.3	0.4	0.0	0.0	0.3	0.3
	Rubber manufactured	0.9	2.1	0.5	0.2	0.2	0.5	4.7	1.9	–	0.1
	Wood and cork manufactures	16.6	5.3	49.3	16.1	1.5	3.9	4.2	9.2	0.3	0.8
	Paper and manufactures	0.8	0.9	0.2	0.2	0.1	0.7	1.0	0.4	0.0	0.3
	Textile yarns and thread	1.4	4.8	0.1	1.3	0.2	1.7	0.6	0.6	–	0.0
	Cotton fabrics	5.7	1.2	0.3	0.5	0.6	2.9	3.1	2.1	3.3	0.3

(Annex Table 30 continued)

SITC	Commodity	Korea 1967	Korea 1975	Philippines 1967	Philippines 1975	Thailand 1967	Thailand 1975	Malaysia 1967	Malaysia 1975	Indonesia 1967	Indonesia 1975
					(Percentage Share)						
	Textile fabrics (noncotton)	8.8	6.4	0.3	0.1	4.3	4.7	0.0	0.4	0.6	0.1
	Building materials	0.2	1.7	0.0	7.3	1.6	4.4	4.1	0.3	-	0.0
	Glass/glassware	0.2	0.2	0.2	0.5	0.4	0.2	0.1	0.3	-	-
	Pearls, precious (and semiprecious) stones	0.0	0.0	-	-	8.8	6.6	-	0.0	0.1	0.3
	Iron and steel ingots	0.1	0.8	-	0.1	-	-	0.0	0.0	-	-
	Iron and steel bars	0.1	1.1	-	0.0	0.0	0.0	0.0	0.1	-	0.1
	Iron and steel plates	0.4	1.7	0.0	0.0	0.3	0.1	1.2	0.1	-	0.0
	Iron and steel tubes	0.1	1.4	-	0.2	0.6	0.7	0.8	0.3	-	0.2
	Tools	0.2	0.1	-	0.1	0.0	0.2	0.1	0.1	-	1.3
	Other manufactured goods	9.3	6.1	5.7	5.4	5.4	6.1	2.7	2.0	2.6	2.2
7	Machinery and transport equipment	6.4	16.5	1.0	3.4	1.1	4.9	3.9	25.6	62.8	23.8
	Power generating machinery	0.4	0.1	-	0.0	0.0	0.0	0.0	0.7	-	5.9
	Office machines	0.0	1.0	-	0.0	-	0.1	0.0	3.4	-	0.2
	Electrical machinery	3.3	10.4	0.0	1.4	0.8	4.0	2.3	13.6	-	9.6
	Road motor vehicles	0.4	0.1	0.0	0.4	0.1	0.2	0.1	1.4	-	0.2
	Aircraft	0.2	0.3	-	0.0	-	0.0	0.0	1.1	-	2.3
	Ships and boats	0.6	3.2	0.8	0.3	0.0	0.0	0.0	0.3	-	0.8
	Other machinery and equipment	1.3	0.9	0.1	1.2	0.2	0.6	1.3	4.9	62.8	4.8
8	Miscellaneous manufactured articles	44.0	44.2	3.7	28.1	3.7	42.9	10.1	23.6	1.9	15.5
	Furniture	0.1	0.3	0.9	1.4	0.1	0.5	1.3	0.4	-	0.2
	Clothing and textile fabrics	26.8	26.6	0.4	8.9	1.8	9.2	3.2	4.5	-	1.8
	Footwear	3.7	4.5	0.2	0.8	0.0	0.1	1.8	1.6	-	0.2
	Scientific and medical instruments	0.1	0.5	-	0.2	0.0	0.3	0.1	14.6	-	2.0
	Watches and clocks	0.0	1.0	-	0.0	-	0.5	0.0	0.3	-	0.0
	Sound recording and medical instruments	0.1	2.0	0.0	0.4	0.0	0.0	0.5	0.3	-	0.3
	Printed matter	0.2	0.4	0.1	0.1	0.0	29.0	1.2	0.3	0.3	6.2
	Toys, sporting goods	0.4	1.6	0.0	-	0.2	0.1	0.1	0.1	-	0.1
	Others	12.5	6.9	2.1	15.7	1.5	3.0	1.9	1.3	1.6	4.7

a/ SITC categories, i.e., excluding mineral and agro-processing industries.

Notes: (1) Major commodity groups as one-digit SITC level are underlined and should add up to 100% except for rounding off. Within a commodity group, only those commodities with a share of 1% or more in any year has been listed.
(2) Entries of 0.0 show either a zero or negligible value.

Source: World Bank, Philippines Industrial Development Strategy and Policies, Washington 1980.

(Annex Table 30 continued)

Annex Table 31

Manufactured exports by type of industry and country sample, 1975
(millions dollars and percentage[a/])

Industry	SITC	Exports of 74 devloping countries (including oil countries)	NICs	Comparative sample of developing countries	Comparative sample of developed countries
A. Resource-based industries					
Petroleum products	332	13,545.1 (41.0)	2,032.5 (24.9)	330.7 (6.1)	542.8 (12.1)
Sugar and honey	061	4,040.7 (12.2)	1,604.1 (19.7)	1,677.9 (12.6)	50.5 (1.1)
Other fixed vegetable oils	422	1,420.1 (4.3)	215.7 (2.6)	347.9 (6.5)	23.0 (0.5)
Copper	682	1,246.8 (3.8)	39.6 (0.5)	1.9 (0.0)	182.3 (4.1)
Animal feeding stuff	081	1,099.4 (3.3)	718.9 (8.8)	192.4 (3.6)	46.8 (1.0)
Tea and mate	074	783.1 (2.4)	34.2 (0.4)	567.2 (10.5)	b -
Tin	687	753.3 (2.3)	28.2 (0.3)	112.2 (2.1)	10.8 (0.2)
Rice, glazed or polished	0422	693.2 (2.1)	6.8 (0.1)	31.8 (0.6)	20.5 (0.5)
Wood, shaped	243	620.5 (1.9)	169.1 (2.1)	113.0 (2.1)	143.7 (3.2)
Fixed vegetable oils, soft	421	516.7 (1.6)	240.1 (2.9)	87.9 (1.6)	156.5 (3.5)
Veneer, plywood	631	497.6 (1.5)	331.2 (4.1)	63.0 (1.2)	62.6 (1.4)
Fruit, preserved, prepared	053	373.9 (1.1)	182.2 (2.2)	106.6 (2.0)	241.1 (5.4)
Fertilizers	561	351.6 (1.1)	30.9 (0.4)	54.3 (1.0)	183.0 (4.1)
Mineral tar etc.	521	335.2 (1.0)	21.6 (0.3)	16.1 (0.3)	2.2 (0.0)
Cocoa powder (unsweetened), butter and paste	0722/3	317.0 (1.0)	13.5 (0.2)	107.5 (2.0)	20.8 (0.5)
Inorganic chemicals	513	287.5 (0.9)	103.1 (1.3)	58.7 (1.1)	178.6 (4.0)
Silver, plantinum etc	681	285.0 (0.9)	6.0 (0.1)	273.0 (5.1)	40.8 (0.9)
Organic chemicals	512	256.4 (0.8)	176.8 (2.2)	30.6 (0.6)	213.9 (4.8)
Meat, tinned, n.e.s.	013	255.6 (0.8)	198.3 (2.4)	0.6 (0.0)	58.6 (1.3)
Aluminium	684	200.7 (0.6)	18.2 (0.2)	45.2 (0.8)	225.3 (5.0)
Total resource-based industries		33,055.9 (100.0)	8,147.1 (100.0)	5,389.9 (100.0)	4,468.7 (100.0)
B. Non-resource-based industries					
Clothing	841	4,255.4 (20.6)	3,428.8 (24.2)	435.2 (12.3)	784.5 (7.7)
Electrical machinery	729	1,003.0 (4.9)	900.9 (6.4)	40.4 (1.1)	199.0 (1.9)
Cotton fabrics	652	943.9 (4.6)	437.0 (3.1)	289.7 (8.2)	99.2 (1.0)
Textile yarn	651	899.9 (4.4)	507.9 (3.6)	232.7 (6.6)	352.9 (3.4)
Road motor vehicles	732	855.9 (4.1)	545.6 (3.9)	85.1 (2.4)	618.4 (6.0)
Woven textiles, non-cotton	653	763.8 (3.7)	433.3 (3.1)	223.1 (6.3)	201.2 (2.0)

Industry	SITC	Exports of 74 developing countries (including oil countries)	NICs	Comparative sample of developing countries	Comparative sample of developed countries
Telecommunications equipment	724	761.2 (3.7)	688.5 (4.9)	16.1 (0.5)	217.8 (2.1)
Footwear	851	610.1 (3.0)	440.5 (3.1)	76.1 (2.1)	698.7 (6.8)
Machines, n.es., non-electrical	719	505.6 (2.4)	356.4 (2.5)	60.4 (1.7)	449.9 (4.4)
Toys, sporting goods	894	481.3 (2.3)	426.7 (3.0)	18.6 (0.5)	94.0 (0.9)
Textile goods, n.e.s.	656	436.9 (2.1)	137.3 (1.0)	192.5 (5.4)	152.0 (1.5)
Office machines	714	429.0 (2.1)	382.9 (2.7)	8.7 (0.2)	90.6 (0.9)
Leather	611	389.2 (1.9)	110.4 (0.8)	198.8 (5.6)	80.0 (0.8)
Other manufactured goods	899	358.7 (1.7)	263.7 (1.9)	57.8 (1.6)	47.9 (0.5)
Floor covering, tapestry	657	344.2 (1.7)	37.6 (0.3)	79.2 (2.2)	63.1 (0.6)
Instruments, apparatus	861	334.2 (1.6)	160.3 (1.1)	10.7 (0.3)	54.0 (0.5)
Cement etc.	661	330.2 (1.6)	126.5 (0.9)	103.0 (2.9)	260.8 (2.5)
Ships, boats	735	327.2 (1.6)	296.0 (2.1)	11.6 (0.3)	758.1 (7.4)
Medicinal products	541	318.6 (1.5)	179.4 (1.3)	50.5 (1.4)	145.2 (1.4)
Power-generating machines, non-electric	711	305.9 (1.5)	237.5 (1.7)	40.5 (1.1)	125.1 (1.2)
Printed matter	892	302.6 (1.5)	155.7 (1.1)	30.8 (0.9)	205.0 (2.0)
Electric power machines	722	298.3 (1.4)	157.4 (1.1)	29.9 (0.8)	220.7 (2.2)
Articles of plastics, n.e.s.	893	273.0 (1.3)	219.6 (1.6)	17.7 (0.5)	45.0 (0.4)
Iron and steel tubes and pipes	678	272.5 (1.3)	184.2 (1.3)	45.6 (1.3)	216.2 (2.1)
Travel goods	831	256.7 (1.2)	201.1 (1.4)	34.7 (1.0)	36.2 (0.4)
Machines for special industries	718	251.4 (1.2)	172.0 (1.2)	19.4 (0.5)	83.8 (0.8)
Watches, clocks	864	238.4 (1.2)	228.2 (1.6)	3.8 (0.1)	24.9 (0.2)
Total non-resource based industries		20,677.9 (100.0)	14,161.0 (100.0)	3,551.5 (100.0)	10,254.8 (100.0)

Source: Data supplied by the United Nations Statistical Office

a/ Value of exports in million dollars and the industry's share in the group's total exports of resource-based industries (A) or non-resource-based industries (B).

b/ Value less than $1,000,000

c/ Totals include other industries

Source: UNIDO, World industry in 1980, New York, 1981.

Annex Table 32

Wages per worker and labour productivity for selected industries in 1974 (in US $)

Sector	Malaysia (1973)		Philippines (1974)		Indonesia (1974)	
	Wage/ worker	Value added/ worker	Wage/ worker	Value added/ worker	Wage/ worker	Value added/ worker
Clothing	455	1,137	309	609	190	388
Textiles	647	1,924	530	2,010	242	824
Wood	938	3,152	530	1,673	288	845
Furniture	843	1,719	456	961	254	457
Leather	513	1,678	412	1,156	240	860
Metal products	1,409	2,538	677	2,316	326	857
Total industry	896	3,561	692	4,329	280	1,245

Sources: Malaysia: Census of Manufacturing Industries, 1973 (coverage all manufacturing enterprises.)

Philippines: Census of Manufacturing Industries, 1974 (coverage enterprises with 5 or more employees).

Indonesia: Census of Manufacturing Industries, 1974/75 (data in table cover small-, medium- and large-scale enterprises).

Annex Table 33

Analysis of changes in imports of labour intensive products in which developing countries market shares made their largest increases over the interval 1965 to 1975 (values in $ million)

SITC	Description	1965 imports: U.S.A. LDCs	1965 imports: U.S.A. Total	1965 imports: Other developed LDCs	1965 imports: Other developed Total	1975 imports: U.S.A. LDCs	1975 imports: U.S.A. Total	1975 imports: Other developed LDCs	1975 imports: Other developed Total	LDCs share in the U.S.A. 1965	LDCs share in the U.S.A. 1975	LDCs share in the U.S.A. Change	LDCs share in other developed 1965	LDCs share in other developed 1975	LDCs share in other developed Change
(89940)	Umbrellas	1.3	7.6	1.1	17.5	14.9	18.1	45.8	104.5	17.1	82.6	65.5	6.3	43.8	37.6
(84130)	Leather clothing	9.2	42.9	1.7	35.1	160.9	216.9	235.9	656.8	21.0	74.2	53.2	4.8	35.9	31.1
(89910)	Carved manufactures	0.8	2.6	1.2	12.7	9.4	15.3	23.6	58.3	30.8	61.5	30.7	9.4	40.4	30.9
(89920)	Basketwork and brooms	5.0	24.1	3.6	53.9	38.4	74.0	77.1	256.8	20.7	51.8	31.1	6.7	30.0	23.3
(83100)	Travel goods	18.6	50.0	5.9	91.4	163.2	217.9	158.6	612.8	37.2	74.9	37.7	6.5	25.9	19.4
(84200)	Fur clothing	0.2	2.0	0.3	28.7	8.0	14.8	75.7	383.5	10.0	53.9	43.9	1.0	19.7	18.7
(63110)	Venner sheets	16.6	45.8	6.3	101.8	14.5	51.1	64.5	271.1	36.2	28.4	-7.9	6.2	23.8	17.6
(71420)	Calculating machines	0.2	53.7	0.1	347.1	111.7	339.4	161.1	982.4	0.4	32.9	32.5	0.0	16.4	16.4
(72420)	Radio receivers	19.8	149.0	8.2	201.3	294.2	661.0	278.1	1,365.1	13.3	44.5	31.2	4.1	20.4	16.3
(84110)	Clothing not knitted	100.5	214.2	104.7	611.3	830.1	1,022.5	1,852.5	5,566.9	46.9	81.2	34.3	17.1	33.3	16.1
(63120)	Plywood	56.0	124.9	27.7	191.4	208.7	262.1	212.4	717.1	44.8	79.6	34.8	14.5	29.6	15.1
(3200)	Canned fish	20.0	83.6	36.6	304.6	44.9	165.7	223.4	824.6	23.9	27.1	3.2	12.0	26.5	14.5
(65550)	Cordage	19.0	48.7	2.5	42.1	73.0	123.4	42.0	205.8	39.0	59.1	20.1	5.9	20.4	14.4
(84140)	Knitted accessories	64.2	221.5	94.7	631.0	932.0	1,123.0	1,240.6	4,327.7	29.0	83.0	54.0	15.0	28.7	13.7
(63200)	Wood products, nes	9.1	77.4	4.4	144.7	77.4	204.9	127.5	780.2	11.8	37.8	26.0	3.0	16.3	13.3
(39990)	Other manufactures, nes	55.8	81.7	11.7	50.9	84.3	94.2	62.7	180.0	68.3	89.5	21.2	23.0	34.8	11.8
(84120)	Clothing accessories	15.5	48.4	11.5	127.9	79.3	139.2	99.0	516.8	32.0	57.0	25.0	9.0	19.2	10.2
(84150)	Headgear	0.9	13.0	0.9	45.6	18.0	34.5	19.3	158.5	6.9	52.4	45.4	2.0	12.2	10.2
(89720)	Imitation jewelry	5.0	17.5	3.5	32.4	50.1	81.8	38.8	186.6	28.6	61.3	32.7	10.8	20.8	10.0
(61200)	Leather manufactures	1.7	10.2	2.4	45.8	18.0	32.5	33.1	226.5	16.7	55.5	38.9	5.2	14.6	9.4
(86410)	Watches	0.8	79.3	0.7	141.0	98.9	298.1	87.5	914.1	1.0	33.2	32.2	0.5	9.6	9.1
(86140)	Photographic cameras	1.1	37.4	1.6	101.7	22.8	175.3	66.5	624.5	2.9	13.0	10.0	1.6	10.6	9.1
(69600)	Cutlery	1.5	43.1	3.2	110.3	16.7	119.5	45.9	412.7	3.5	13.9	10.5	2.9	11.1	8.2
(72930)	Thermionic materials	9.2	63.2	0.8	375.2	729.9	910.7	223.4	2,738.3	14.6	80.2	65.6	0.2	8.2	7.9
(65100)	Textile yarn	5.9	63.6	21.1	1,035.1	21.7	130.4	386.9	4,030.3	9.3	16.6	7.4	2.0	9.6	7.6
(65350)	Synthetic fabrics	0.6	28.1	1.6	239.0	13.9	172.8	164.5	2,018.6	2.1	8.0	5.9	0.7	8.1	7.5
(69700)	Household equipment	4.8	33.2	3.4	175.7	56.6	135.6	67.7	767.5	14.5	41.7	27.3	1.9	8.8	6.9
(24300)	Shaped wood	25.3	375.2	162.7	1,466.0	55.4	792.2	596.6	3,378.7	6.7	7.0	0.3	11.1	17.7	6.6
(63180)	Simply worked wood	8.6	20.7	0.3	18.5	22.1	46.7	39.8	501.2	41.5	47.4	5.8	1.6	7.9	6.3
(89110)	Tape recorders	0.0	100.6	0.2	211.6	76.6	603.3	76.9	1,228.1	0.0	12.7	12.7	0.1	6.3	6.2
(73310)	Bicycles and parts	0.3	30.9	0.1	42.7	23.6	136.6	18.6	309.6	1.0	17.3	16.3	0.2	6.0	5.8
(61100)	Leather	20.4	67.5	73.6	313.9	44.4	89.2	324.5	1,110.7	30.2	49.8	19.6	23.4	29.2	5.8
(85100)	Footwear	10.6	159.9	26.6	367.9	545.1	1,301.4	334.2	2,612.8	6.6	41.9	35.3	7.2	12.8	5.6
(61300)	Tanned fur skins	0.1	11.2	1.8	105.5	0.7	10.5	27.2	377.3	0.9	7.1	6.2	1.7	7.2	5.5
(89710)	Gold jewelry	1.1	15.8	3.6	115.9	38.5	128.1	50.3	576.5	7.0	30.0	23.1	3.3	8.7	5.4
(66130)	Building stone	0.4	15.1	0.7	42.9	2.4	32.8	17.0	248.7	2.6	7.3	4.6	1.6	6.8	5.2
(65360)	Other fabrics	0.7	25.0	2.5	334.7	0.6	12.7	34.0	680.3	2.8	4.4	1.6	0.7	5.0	4.2
(64400)	Tulle or lace	2.2	16.5	2.6	153.1	6.7	19.6	17.5	303.4	13.3	34.1	20.8	1.7	5.6	4.1
(89100)	Musical instruments	1.9	56.0	0.7	166.3	122.8	782.8	107.9	2,423.8	3.4	14.4	11.0	0.4	4.4	4.0
(41110)	Oils of fish	0.7	6.0	26.9	133.1	0.2	3.2	53.9	210.6	11.7	4.8	-6.9	21.7	25.6	3.9
(65600)	Made-up textile fabrics	6.5	34.8	31.8	198.3	53.7	98.3	198.8	1,007.0	18.7	54.6	36.0	16.0	19.7	3.7
(89400)	Sporting goods	23.6	140.6	40.1	363.6	297.2	636.0	293.7	1,990.9	16.8	46.7	29.9	11.0	14.8	3.7
(86420)	Clocks	0.0	20.9	0.4	110.7	38.4	128.2	17.6	454.4	0.0	29.9	29.9	0.4	3.9	3.5
(71730)	Sewing machines	0.1	71.2	0.6	133.7	13.8	187.2	17.5	448.8	0.1	7.4	7.2	0.4	3.9	3.5
(65500)	Special textile fabric	4.3	15.9	1.3	212.5	83.3	215.1	57.4	1,473.3	27.0	39.0	11.9	0.6	3.9	3.3
(71490)	Other machines	1.1	31.2	0.3	360.1	99.5	449.4	60.9	1,958.8	3.5	22.1	18.6	0.1	3.1	3.0
TOTAL		551.2	2,882.7	740.4	10,146.1	5,707.1	12,507.9	8,458.3	51,201.2	19.1	45.6	26.5	7.3	16.5	9.2

Source: H.D. Tuong and A. Yeats, "On factor proportions as a guide to future composition of developing countries exports", Journal of Development Economics, Vol. 7 (1980), pp. 521-539.

(Annex Table 33 continued)

Analy is of changes in imports of labour intensive products in which developing countries market shares fell or showed only slight increases over the interval 1965 to 1975 (values in million)

		1965 imports				1975 imports									
		U.S.A.		Other developed		U.S.A.		Other developed		LDCs share in the USA			LDCs share in other developed		
SITC	Description	LDCs	Total	LDCs	Total	LDCs	Total	LDCs	Total	1965	1975	Change	1965	1975	Change
(66700)	Precious stones	16.4	46.0	38.4	117.2	329.2	851.5	628.6	4,163.9	35.7	38.7	3.0	32.8	15.0	-17.7
(8140)	Fish or meat meal	23.9	34.9	127.9	267.8	17.7	27.8	116.7	373.9	68.5	63.7	-4.8	47.8	31.2	-16.6
(41100)	Fish oils	0.7	6.0	28.9	133.1	0.2	12.5	54.7	555.7	11.7	1.2	-10.5	21.7	9.9	-11.9
(55100)	Essential oils	18.8	45.6	33.7	164.8	30.5	77.7	61.3	479.2	41.2	39.3	-1.9	20.4	12.8	-7.7
(65610)	Textile bags	0.4	0.7	50.4	74.2	0.7	1.2	63.3	103.7	57.1	54.6	-2.6	67.9	61.0	-6.9
(65340)	Woven jute fabrics	174.0	186.7	55.9	76.5	123.2	124.1	66.9	97.3	93.2	99.3	6.1	73.1	68.8	-4.3
(65700)	Floor coverings	15.7	54.3	120.7	415.1	45.4	106.0	465.8	1,787.0	28.9	42.8	13.9	29.1	26.1	-3.0
(81240)	Lighting fixtures	4.8	33.0	8.0	108.1	19.2	59.3	27.5	533.1	14.5	32.4	17.8	7.4	5.2	-2.2
(63300)	Cork manufactures	0.1	3.9	2.4	43.9	0.0	10.3	3.8	102.0	2.6	0.4	-2.2	5.5	3.7	-1.8
(66180)	Cement building material	1.0	5.8	0.8	46.0	2.6	6.8	0.8	180.0	17.2	38.6	21.4	1.7	0.4	-1.3
(63140)	Improved wood	0.1	0.8	0.6	53.5	0.0	4.3	1.1	366.2	12.5	0.0	-12.5	1.1	0.3	-0.8
(89960)	Orthopaedic goods	0.3	3.1	0.4	26.4	0.9	15.5	2.0	245.8	9.7	5.7	-4.0	1.5	0.8	-0.7
(62100)	Rubber materials	0.0	0.0	2.3	119.6	0.0	0.4	8.0	554.3	0.0	2.1	2.1	1.9	1.4	-0.5
(5500)	Prepared vegetables	23.1	45.3	52.6	238.6	78.7	183.8	250.6	1,164.8	51.0	42.8	-8.1	22.0	21.5	-0.5
(65370)	Knitted fabrics	0.1	9.4	3.2	169.2	1.3	49.1	12.4	891.5	1.1	2.6	1.5	1.9	1.4	-0.5
(65330)	Linens	0.0	0.0	0.2	16.0	0.0	0.0	0.6	57.9	0.0	0.0	0.0	1.2	1.0	-0.3
(6200)	Sugar confectionery	0.4	16.6	1.3	58.3	15.0	79.6	8.5	373.2	2.4	18.9	16.5	2.2	2.3	0.0
(65190)	Textile yarn, nes	1.2	2.0	13.2	35.5	6.6	7.3	16.6	44.4	60.0	90.2	30.2	37.2	37.3	0.1
(71980)	Mehanical goods, nes	0.3	55.6	0.4	447.0	18.3	316.6	5.4	2,303.0	0.5	5.8	5.2	0.1	0.2	0.1
(84160)	Rubber clothing	0.0	0.0	0.1	9.9	0.0	0.0	0.7	60.2	0.0	0.0	0.0	1.0	1.2	0.2
(89950)	Toilet articles	0.7	8.7	2.1	57.2	1.7	26.9	8.1	210.0	8.0	6.2	-1.9	3.7	3.9	0.2
(71200)	Agricultural machines	0.5	194.5	0.1	935.7	9.7	872.1	8.1	3,698.8	0.3	1.1	0.9	0.0	0.2	0.2
(71520)	Metal working machines	0.0	7.4	0.1	145.2	0.8	41.2	1.7	715.4	0.0	1.8	1.8	0.1	0.2	0.2
(71830)	Food processing machines	0.1	14.7	0.2	90.0	1.8	49.1	1.6	418.6	0.7	3.7	3.0	0.2	0.4	0.2
(89930)	Candles and machines	0.8	19.2	2.0	60.0	9.1	60.2	11.9	322.5	4.2	15.1	10.9	3.3	3.7	0.3
(71810)	Paper mill machinery	0.0	22.4	0.1	173.9	0.6	83.9	2.6	761.7	0.0	0.7	0.7	0.1	0.3	0.3
(71710)	Textile machinery	0.0	81.4	0.3	547.5	2.2	329.3	8.8	1,990.2	0.0	0.7	0.7	0.1	0.4	0.4
(71960)	Machines, nes	0.1	17.9	0.5	307.9	6.1	104.1	8.8	1,596.1	0.6	5.8	5.3	0.2	0.5	0.4
(73100)	Railway vehicles	0.0	7.4	0.2	114.5	3.4	90.6	2.9	488.0	0.0	3.8	3.8	0.2	0.6	0.4
(73290)	Motorcycles and parts	0.0	141.0	0.0	77.6	4.4	744.4	3.6	658.3	0.0	0.6	0.6	0.0	0.5	0.5
(71950)	Power tools, nes	0.1	34.3	0.2	261.8	8.1	220.1	7.6	1,338.5	0.3	3.7	3.4	0.1	0.6	0.5
(71992)	Taps and valves	0.2	12.2	0.5	309.1	11.7	167.9	11.0	1,756.6	1.6	7.0	5.3	0.2	0.6	0.5
(65310)	Silk fabrics	2.3	29.7	2.5	45.5	1.6	16.7	15.4	251.4	7.7	9.4	1.7	5.5	6.1	0.6
(65390)	Woven fabrics, nes	1.5	37.4	0.2	16.4	3.6	21.7	0.3	18.9	4.0	16.4	12.4	1.2	1.8	0.6
(72940)	Automotive equipment	0.0	9.1	0.7	142.0	22.7	112.2	8.8	837.1	0.0	20.2	20.2	0.5	1.0	0.6
(71510)	Machine tools	0.3	56.1	0.5	684.1	7.9	326.5	15.3	2,360.7	0.5	2.4	1.9	0.1	0.6	0.6
(69890)	Metal articles, nes	3.3	41.4	1.6	206.3	20.1	272.0	18.7	1,243.0	8.0	7.4	-0.6	0.8	1.5	0.7
(71430)	Statistical machines	0.0	4.2	4.0	264.0	1.2	129.0	86.4	3,794.3	0.0	0.9	0.9	1.5	2.3	0.8
(73280)	Motor vehicle bodies	0.7	157.6	1.0	1,770.0	97.1	2,507.2	82.6	9,706.8	0.4	3.9	3.4	0.1	0.9	0.8
(86160)	Photographic apparatus	0.0	4.3	0.6	119.8	0.7	25.1	17.1	1,201.2	0.0	2.7	2.7	0.5	1.4	0.9
(86170)	Medical instruments,nes	0.2	13.2	0.8	89.2	7.1	99.9	14.0	772.7	1.5	7.1	5.6	0.9	1.8	0.9
(69880)	Miscellaneous metal art.	1.1	3.9	0.3	72.4	4.1	40.4	4.5	341.7	28.2	10.1	-18.1	0.4	1.3	0.9
(71920)	Pumps	0.2	34.7	0.9	643.8	7.3	344.3	42.2	3,655.8	0.6	2.1	1.6	0.1	1.2	1.0
(66300)	Mineral products, nes	3.9	16.6	0.9	240.9	9.6	83.2	15.7	1,119.9	23.5	11.5	-12.0	0.4	1.4	1.0
(66400)	Glass	2.4	56.6	0.4	278.4	6.3	119.3	12.1	1,015.9	4.2	5.3	1.0	0.1	1.2	1.0
Total		299.7	1,575.6	562.1	10,273.9	938.3	8,821.0	2,204.7	54,731.2	19.0	10.6	-8.4	5.5	4.0	-1.4

Source: H.D. Tuong and A. Yeats (1980), op.cit

Annex Table 34

Export performance ratios for manufacturing industries, by country sample

SITC	Commodity (industry)	Type codes[a/] RES	SK	PD	FI	Export performance ratio (1966-1967/1975-1976) Developed countries, comparative sample	NICs	Developing countries, comparative sample
012	Meat, dried, salted or smoked	R				- b/	- b/	- b/
013	Meat and meat preparations	R				5.1/4.0	24.3/18.4	-
022	Milk and cream	R				-	-	0.0/0.4
023	Butter	R				-	-	-
024	Cheese and curd	R				-	-	-
032	Fish and fish preparations	R				18.6/8.2	2.3/2.5	0.4/3.6
0422	Rice, glazed or polished	R				-	-	12.4/3.4
046	Meal and flour of wheat or of meslin	R				-	0.9/3.0	-
047	Meal and flour of cereals	R				-	-	-
048	Cereal preparations	R				0.1/0.7	0.8/0.9	0.7/0.9
052	Dried fruit	R				131.9/61.2	73.4/87.7	2.0/6.0
053	Fruit,preserved and fruit preparations	R				13.1/12.3	6.6/5.4	16.4/13.8
055	Vegetables, preserved or prepared	R				19.1/11.7	1.4/2.1	14.2/30.9
061	Sugar and honey	R				0.2/0.5	19.8/10.1	49.2/24.0
062	Sugar confectionery	R				2.9/1.7	-	-
0713	Coffe extracts, essences etc.	R				-	18.4/38.3	63.8/27.6
0722/3	Cocoa powder (unsweetened), butter and paste	R				0.2/2.1	-	73.7/161.4
073	Chocolate etc.	R				-	0.2/4.5	2.1/26.9
074	Tea and mate	R				-	2.1/3.2	131.3/297.2
081	Feeding stuff for animals	R				0.6/0.5	9.7/14.0	6.3/4.4
091	Margarine and shortening	R				-	-	-
099	Food preparations not elsewhere specified	R				1.0/0.8	1.5/1.3	0.4/0.7
111	Non-alcoholic beverages, not elsewhere specified	R				-	-	-
112	Alcoholic beverages	R				6.7/5.6	0.5/0.8	3.5/1.9
122	Tobacco manufactures	R				-	-	0.8/1.2
2219	Flour and meat of oil seeds etc.	R				-	-	-
2312	Synthetic rubber etc	R				-	-	-
243	Wood, shaped or simply worked	R				1.5/2.1	4.7/1.7	5.4/3.9
251	Pulp and waste paper	R				0.6/2.0	0.1/0.2	-
2626-8	Wool shoddy, wool or other animal hair, wool tops	R				-	-	-
266	Synthetic and regenerated fibres	R				0.6/0.8	-	-
332	Petroleum products	R				1.2/1.6	9.7/7.0	0.9/1.4

Annex Table 34 (continued)

Export performance ratios for manufacturing industries, by country sample

SITC	Commodity (industry)	Type codes[a/] RES	SK	PD	FI	Export performance ratio (1966-1967/1975-1976) Developed countries, comparative sample	NICs	Developing countries, comparative sample
411	Animals oils and fats	R				-	-	-
421	Fixed vegetable oils, soft	R				14.1/4.7	9.2/11.0	35.9/27.1
422	Other fixed vegetable oils	R				-	19.1/9.9	76.7/74.9
431	Animal and vegetable oils, processed etc	R				-	9.2/2.0	-
512	Organic chemicals	R				0.6/0.7	0.6/0.5	0.1/0.2
513	Inorganic chemicals elements etc	R				3.6/1.7	2.4/2.1	1.1/4.0
514	Other inorganic chemicals	R				0.8/1.7	0.4/1.0	0.1/0.6
515	Radioactive materials etc	R				-	-	-
521	Mineral tar etc	R				-	-	1.9/20.1
531	Synthetic organic dyestuffs etc.		H	L	K	-	-	0.0/0.3
532	Dyeing and tanning extracts etc.		H	L	K	-	38.7/36.1	-
533	Pigments, paints, etc		H	L		1.0/1.5	0.5/0.3	0.2/0.4
541	Medicinal and pharmaceutical products		H	L	K	0.6/0.8	1.3/0.9	0.4/0.5
551	Essential oils etc.		H	L	L	1.7/0.9	3.5/2.0	1.3/7.1
553	Perfumery and cosmetics		H	L	K	1.0/0.8	-	1.5/6.6
554	Soaps, cleansing and polishing preparations		H	H	K	0.7/0.7	-	0.3/0.5
561	Fertilizers, manufactured	R				2.0/2.9	0.2/0.2	2.1/1.3
571	Explosives etc.		H	L	K	2.1/8.7	-	-
581	Plastic materials etc.		L	H	K	0.3/0.4	0.1/0.1	0.1/0.2
599	Chemical materials and products not elsewhere specified					2.0/1.6	0.7/0.6	0.2/0.6
611	Leather		L	L	L	2.0/2.1	2.3/6.3	16.8/21.2
612	Manufactured of leather not elsewhere specified		L	H	L	5.0/3.4	0.8/2.2	0.3/2.6
613	Fur skins, tanned or dressed		L	L	L	20.9/17.6	-	-
621	Materials of rubber		L	L	L	0.3/0.8	-	-
629	Articles of rubber not elsewhere specified		L	H	K	1.6/2.7	0.3/1.1	0.8/0.3
631	Venners, plywood etc.	R				2.9/1.5	22.1/8.1	17.4/5.4
632	Wood manufactures not elsewhere specified	R				7.6/2.5	0.9/1.6	1.2/6.2
633	Cork manufactures	R				100.7/160.5	-	-
641	Paper and paperboard	R				0.3/0.5	0.0/0.1	-
642	Articles made of paper etc	R				0.8/1.0	0.6/0.6	5.9/1.4
651	Textile yarn and thread		L	L	L	2.5/3.0	1.1/3.0	4.2/5.6
652	Cotton fabrics		L	L	L	4.2/2.8	8.2/6.5	4.9/8.3

Annex Table 34 (continued)

Export performance ratios for manufacturing industries, by country sample

SITC	Commodity (industry)	Type codes[a/] RES	SK	PD	FI	Export performance ratio (1966-1967/1975-1976) Developed countries, comparative sample	NICs	Developing countries, comparative sample
653	Textile fabrics, other than cotton		L	L	L	0.8/1.1	1.0/2.1	7.9/2.4
654	Tulle, lace, embroidery etc		L	L	L	1.0/1.5	1.6/5.2	-
655	Special textile fabrics etc		L	L	L	3.7/1.6	1.1/1.2	0.5/1.3
656	Made-up articles of textile materials not elsewhere specified		L	H	L	4.1/7.7	5.1/3.0	22.6/12.7
657	Floor coverings tapestries etc		L	H	L	0.9/2.6	0.6/2.2	4.6/5.9
661	Lime, cement etc		L	L	K	2.6/10.3	0.7/3.1	4.1/4.4
662	Clay construction materials etc		L	L	L	1.1/2.3	0.8/0.6	0.3/0.5
663	Mineral manufactures not elsewhere specified		H	L	L	1.0/0.9	0.2/0.6	0.2/0.3
664	Glass		L	L	K	0.5/0.7	0.3/0.9	-
665	Glassware		L	L	L	1.5/1.6	1.3/2.3	0.2/0.6
666	Pottery		L	L	L	0.6/1.4	-	-
671	Pig iron etc		L	H	K	1.8/4.0	2.0/4.4	3.2/3.2
672	Primary forms of iron and steel		L	L	K	0.4/0.4	0.2/0.3	0.0/0.3
673	Iron and steel bars etc.		L	H	K	0.3/2.0	0.4/0.3	0.7/0.9
674	Universals etc of iron and steel		L	H	K	0.0/0.5	0.6/0.3	0.0/0.1
675	Hoop and strips of iron and steel		L	H	K	-	-	-
676	Rails etc.		L	H	K	3.7/1.8	-	0.7/2.1
677	Iron and steel wire		L	L	K	-	-	-
678	Tubes, pipes of iron and steel		L	H	K	0.6/0.8	-	-
679	Iron and steel castings etc. not elsewhere		L	L	K	2.6/1.5	-	-
681	Silver, plantinum etc	R				0.5/0.6	-	1.7/18.0
682	Copper	R				2.3/2.8	1.0/0.2	-
683	Nickel	R				-	-	0.0/8.3
684	Aluminium	R				3.4/3.8	0.1/0.2	17.1/6.0
685	Lead	R				6.4/4.5	24.8/17.8	-
686	Zinc	R				1.6/4.1	2.2/10.5	-
687	Tin	R				-	0.5/2.6	100.6/114.0
689	Miscellaneous non-ferrous base metals	R				-	-	-
691	Finished structural parts not elswhere specified		H	H		1.1/1.2	0.2/0.3	0.1/0.3
692	Metal containers		H	L		1.4/2.0	2.5/0.9	-
693	Wire products (excluding electric)		H	L	L	2.1/1.9	0.4/1.1	0.4/0.8
694	Nails, screws, etc		H	L	K	1.0/1.7	0.2/0.6	0.2/0.5
695	Tools		L	L	K	1.1/1.4	0.3/0.5	0.2/0.6
696	Cultery		L	L	L	1.2/1.9	1.1/3.6	-

Annex Table 34 (continued)

Export performance ratios for manufacturing industries, by country sample

SITC	Commodity (industry)	Type codes a/ RES	SK	PD	FI	Export performance ratio (1966-1967/1975-1976) Developed countries, comparative sample	NICs	Developing countries, comparative sample
697	Household equipment		H	L	L	1.7/3.3	3.6/2.8	0.4/1.4
698	Manufactures of metal not elsewhere specified		H			1.6/5.2	1.1/0.8	0.2/0.3
711	Power generating machines, non-electric		H	L		0.3/0.4	0.1/0.7	0.0/0.1
712	Agricultural machinery		H	L	L	0.4/0.5	0.0/0.4	-
714	Office machines		H	H	L	0.2/0.4	0.6/1.0	-
715	Metal-working machinery		H	L	L	0.8/1.0	0.1/0.2	0.0/0.1
717	Textile and leather machinery		H	L	L	1.4/0.6	0.2/0.2	0.1/0.1
718	Machines for special industries		H	L	L	0.2/0.3	0.2/0.4	0.1/0.1
719	Machinery and appliances not elsewhere specified		H	L	L	0.2/0.5	0.1/0.3	0.1/0.1
722	Electric power machinery etc		H	L	L	0.7/0.9	0.1/0.4	0.0/0.2
723	Equipment for distributing electricity		H	L	L	5.3/3.1	0.3/0.4	0.1/0.4
724	Telecommunications apparatus		H	L	L	0.2/0.8	1.2/1.5	0.0/0.1
725	Domestic electrical equipment		H	L	L	0.2/1.1	0.4/1.1	0.1/0.1
726	Electric apparatus, medical etc.		H	L	L	-	-	-
729	Other electrical machinery		H	L	L	0.2/0.5	0.7/1.9	0.1/0.3
731	Railway vehicles		L	L	L	5.0/2.7	0.0/0.9	0.1/0.7
732	Road motor vehicles		L	H		0.2/0.4	0.1/0.3	0.0/0.1
733	Road vehicles other than motor vehicles		L	H		1.9/1.5	0.3/0.6	0.3/1.1
734	Aircraft		H	L		0.2/0.6	0.2/0.2	-
735	Ships and boats		H	L	L	2.8/1.3	0.2/1.0	0.0/0.1
812	Sanitary, plumbing, heating fixtures		L	L	L	2.2/1.5	4.6/2.4	0.1/0.6
821	Furniture		L	L	L	4.3/2.9	1.4/0.7	0.3/0.6
831	Travel goods		L	L	L	1.6/1.9	6.4/10.6	0.5/5.5
841	Clothing		L	L	L	2.5/2.9	14.1/13.2	0.3/2.9
842	Fur clothing		L	L	L	4.1/6.8	0.8/8.6	-
851	Footwear		L	L	L	5.4/7.5	4.6/4.9	1.6/1.5
861	Scientific etc. instruments		H	L	K	0.2/0.3	0.1/0.4	0.0/0.1
862	Photographic cinematographic supplies		H	H		-	0.1/1.0	-
864	Watches and clocks		L	H	K	0.0/0.3	0.8/4.3	-
891	Musical instruments etc		H	H	L	0.2/0.3	0.2/1.6	-
892	Printed matter		H	H	L	4.1/2.7	1.4/1.6	0.3/1.3
893	Articles of artifical plastic materials		L	H	L	1.0/1.1	1.5/3.3	0.1/0.5
894	Perambulators, toys, sporting goods		L	L	L	1.0/1.6	11.9/10.3	0.0/0.4
895	Office and stationery supplies not elsewhere specified			L		-	-	-
897	Jewellery etc.		L	L	L	1.0/1.8	3.0/6.0	0.6/0.9
899	Manufactured articles not elsewhere specified		L	L	L	1.4/0.9	17.7/5.1	0.5/4.3

Note: The SITC items listed are understood to be "trade in manufacturers" as defined in the first section of Chapter II, with the addition of the following seven SITC groups or subgroups: fresh, chilled or frozen meat (011), eggs (025), reclaimed rubber (2313), waste and scrap of unhardened rubber (2314), waste of wool and other animal hair, not elsewhere specified (2629), cotton (263) and waste materials from textile fabrics (267). Because of the high proportion of primary items included in SITC 011, 025, and 263 and the waste character of the other trade categories, they were excluded from the detailed presentation. For a description of each product category, see Standard International Trade Classification, Revision 2, (United Nations publication, Sales No. 75.XVII.6).

a/ In the columns headed "Type codes", industries are classified by four different criteria:

(a) Resource dependence (RES): The identification of resource-based industries (R) relied heavily on the work of S. Hirsch, "Capital or technology? Confronting the neo-factor proportions and neo-technology accounts of international trade", Weltwirtschaftliches Archiv, Band CX, Heft 4, p. 343. All products included in SITC classifications 0, 1 and 4 and part of SITC 2 were considered to be resource-based.

(b) Skill intensity (SK): The designations of a high (H) or low (L) level of skill intensity for industries that were not resource-based drew upon the work of H.B. Lary regarding the percentage of the skilled labour force in the United States. See Imports of Manufactures from Less Developed Countries (New York, National Bureau of Economic Research, 1968). Use was also made of the work by S. Hirsch, "The product cycle model of international trade - a multi-country cross-section analysis", Oxford Bulletin of Economics and Statistics, vol. 37, No. 4 (November 1975), and G.C. Hufbauer, "The impact of national characteristics and technology on the commodity composition of trade in manufactured goods", in The Technology Factor in International Trade, R. Vernon, ed. (New York Bureau of Economic Research, 1970). The dividing line between the two designations was taken to be the arithmetic mean of the sampled skill ratios.

(c) Product development (PD): Following J.M. Finger, "A new view of the product cycle theory", Weltwirtschaftliches Archiv, Band CXI, 1975, p. 79, industries were classified according to high (H) or low (L) rates of "product development". Rates of product turnover (defined as the number of items that appeared or disappeared over a given period as a percentage of the total number of items in the SITC group or subgroup) derived from United States data for the period 1965-71 and presented in Finger's article, were used for this classification. Again the simple above-mean (H) or below-mean (L) criterion was applied.

Annex Table 34
(continued)

(d) Factor intensity (FI): The sources used for classifying industries into a labour-intensive (L) and a capital-intensive (K) subgroup were the following (listed in priority order of use):

(i) A.H.M. Mahfuzur Rahman, Exports of Manufactures from Developing Countries, A Study on Comparative Advantage (Rotterdam University Press, 1973), p. 131 (based on 1965 data from India on capital per man);

(ii) Lary, op. cit., p. 191 (based on 1965 United States data on value added per employee);

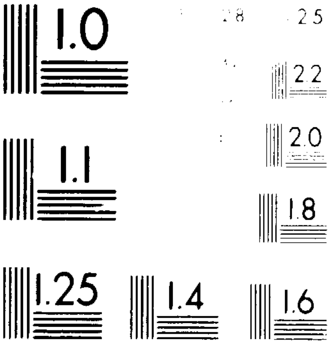
(iii) Hirsch, loc. cit., pp. 311, 317;

(iv) G.C. Hufbauer, loc. cit., table A-2.

b/ A dash (-) in one of the last three columns of the table indicates that the 1975/76 value of exports of that industry accounted for less than 0.1 per cent of total manufacturing exports of the respective country group.

Source: UNIDO, World industry in 1980, New York, 1981.

84.05.10


1.0
2.8
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

Annex Table 35

Indonesia: Elasticities of consumption for selected consumer goods, 1976.

	Elasticity[1/]
Low elasticities < 1	
Cassava flour	0.16
Salted and dried fish	0.60
Fish paste	0.49
Brown sugar	0.53
Cane sugar	0.98
Tea	0.65
Coffee	0.93
Laundry soap	0.89
High elasticities > 1	
Wheat flour	1.70
Canned fish	1.93
Soya sauce	1.53
Vegetable cooking oil	1.10
Soft drinks	2.40
Toiletsoap	1.29
Cosmetics	1.50
Medicines	1.45
Stationery and books	1.21
Clothing	1.22
Footwear	1.63
Furniture	2.92
Household utensils	1.61

Source: Calculated from BPS Socio-Economic Survey, 1976.

1/ Estimated through the use of the equation, $\ln y_i = a + b \ln x$, where y_i is consumption of good i, x is total consumption and b is the consumption elasticity.

Annex Table 36

Growth and size elasticities, 1969-1973, for large countries

ISIC	Sector	Growth	Size
311	Food products	1.07	- 0.11
313	Beverages	1.15	- 0.62
314	Tobacco	0.65	- 0.12
321	Textiles	1.02	- 0.04
322	Wearing apparel	1.55	- 0.59
323	Leather and fur products	1.15	- 0.28
324	Footwear	1.14	- 0.57
331	Wood and cork products	1.19	- 0.31
332	Furniture and fixtures	1.57	- 0.23
341	Paper	1.77	- 0.17
342	Printing and publishing	1.50	- 0.17
351	Industrial chemicals	1.67	0.18
352	Other chemicals	1.35	0.10
353	Petroleum refineries	1.05	- 0.04
354	Miscellaneous products of petroleum and coal	1.13	0.10
355	Rubber products	1.22	0.27
356	Plastic products	1.49	- 0.12
361	Pottery, china and earthenware	1.13	- 0.41
362	Glass	1.58	- 0.13
369	Other non-metallic mineral products	1.22	- 0.19
371	Iron and steel	1.81	0.27
372	Non-ferrous metals	1.44	0.09
381	Metal products, excluding machinery	1.48	- 0.15
382	Non-electrical machinery	2.05	0.40
383	Electrical machinery	1.77	0.11
384	Transport equipment	1.86	0.25
385	Professional and scientific equipment, photographic and optical goods	2.10	0.40
390	Other manufactures	1.29	- 0.11

Source: UNIDO, World Industry since 1960: Progress and Prospects, United Nations, New York, 1979

Note: The equation for the regression analysis had the form $\ln (V/N) = a + b \ln Y + c \ln B$, where V is value added in millions of 1970 dollars, Y is per capita GDP and N is population in millions. Data includes that for both developing and developed market economies.

Annex Table 37

Distribution of production of domestic manufacturing over main supply categories and distribution of domestically produced intermediate manufactures over main purchasing sectors

Units %

Distribution total domestic production of manufactures	
Intermediates	37
Consumption	47
Capital formation	8
Stocks	4
Exports	4
Total	100
Distribution domestic production of intermediate manufactures	
1. Agriculture	7
2. Mining	3
3. Agriculture processing	-
4. Main manufacturing	40
5. Oil refinery/LNG	1
6. Electricity	1
7. Construction	24
8. Trade	12
9. Transport	8
10. Financial	-
11. Public adm.	-
12. Other services	4
13. Unspec.	-
Total	100

Source: Ministry of Industry/NEI, "Structural Analysis of the Indonesian Manufacturing Sector", Rotterdam, February, 1983.

Component shares of demand for domestically produced goods (total demand = 100)

(Industry Sectors) Nr.	Sector	Total Interm. Output	190 Private Consumption	302 Govern. Consumption	303 Gross Fixed Capital Form.	304 Net Change in Stocks	305+306 Exports of Goods/ Serv.	310 Total Demand
7	Handpounded rice	29.63	64.94	0.00	0.00	5.43	0.00	100.00
8	Cassava products	12.74	77.51	0.00	0.00	.75	9.00	100.00
9	Rubber	17.48	0.00	0.00	0.00	-6.01	88.54	100.00
10	Brown sugar	44.46	47.76	3.48	0.00	4.30	0.00	100.00
11	Copra	89.65	0.00	0.00	0.00	-5.22	15.58	100.00
12	Farm coconut oil	32.95	69.47	0.00	0.00	-2.41	0.00	100.00
13	Processed tobacco	18.80	87.43	0.00	0.00	-6.26	.04	100.00
14	Farm proc. coffee	84.95	6.26	3.69	0.00	5.09	0.00	100.00
15	Farm proc. tea	2.23	48.14	.41	0.00	-3.63	52.85	100.00
16	Slaughtering	12.28	85.77	0.00	0.00	.27	1.69	100.00
17	Sawmilling in forest	79.38	0.00	0.00	0.00	.65	19.97	100.00
18	Drying,salting fish	2.98	91.56	0.00	0.00	4.39	1.07	100.00
22	Meat processing	17.44	79.94	0.00	0.00	2.46	.16	100.00
23	Dairy products	33.26	66.22	0.00	0.00	.45	.07	100.00
24	Fruits/veget. proc.	33.47	5.19	0.00	0.00	3.41	57.94	100.00
25	Fish processing	4.82	94.58	0.00	0.00	.26	.34	100.00
26	Coconut cook. oil	9.98	62.79	0.00	0.00	.03	27.21	100.00
27	Other veget/an. oil	54.03	35.51	0.00	0.00	.00	10.45	100.00
28	Rice milling	10.34	83.44	0.00	0.00	5.78	.44	100.00
29	Grain mill products	73.64	16.14	0.00	0.00	2.50	7.72	100.00
30	Sugar	31.82	64.42	0.00	0.00	.82	2.94	100.00
31	Bakery products	36.66	60.27	0.00	0.00	3.05	.02	100.00
32	Noodles/macaroni	56.85	39.93	0.00	0.00	3.22	.00	100.00
33	Cocoa, choc., sugar	11.44	19.39	0.00	0.00	.02	69.15	100.00
34	Coffee grinding	4.28	88.09	4.62	0.00	2.21	.80	100.00
35	Tea processing	30.00	67.13	.55	0.00	2.22	.09	100.00
36	Soya bean processing	4.34	91.88	0.00	0.00	3.77	.00	100.00
37	Other food products	21.03	74.12	0.00	0.00	4.23	.62	100.00
38	Alcoholic beverages	38.97	54.49	0.00	0.00	1.62	4.92	100.00
39	Soft drinks	51.04	45.85	2.92	0.00	.02	.17	100.00
40	Cigarettes	.09	80.07	0.00	0.00	19.77	.07	100.00
41	Spinning	80.32	18.09	0.00	0.00	.71	.88	100.00
42	Weaving	32.24	63.43	0.00	0.00	.13	4.20	100.00
43	Textile finishing	87.98	0.00	0.00	0.00	12.02	0.00	100.00
44	Batik	36.62	54.66	0.00	0.00	-2.19	10.91	100.00
45	Knitting	12.42	83.96	0.00	0.00	-7.79	11.40	100.00
46	Made-up textile g.	12.38	68.45	4.83	0.00	-2.97	17.30	100.00
47	Carpets, rugs, ropes	116.21	6.52	4.22	1.40	-33.01	4.65	100.00
48	Tann./leather proc.	85.97	0.00	0.00	0.00	1.69	12.34	100.00
49	Leather products	9.04	78.72	17.61	0.00	-6.39	1.02	100.00
50	Sawm. and other proc.	90.71	0.00	0.00	0.00	.77	.2	100.00
51	Wood and cork	84.23	5.97	4.04	1.57	1.60	..58	100.00
52	Furniture, fixtures	5.68	70.81	0.00	20.28	2.46	.78	100.00
53	Pulp and paper	82.10	.39	21.10	0.00	-7.72	4.13	100.00
54	Paper products	88.42	2.06	18.43	0.00	-8.91	.01	100.00
55	Printing, publishing	37.85	27.93	34.81	0.00	-.62	.03	100.00
56	Basic chemicals	145.13	2.91	15.71	0.00	-84.30	20.54	100.00

Annex Table 36 (continued)

Component shares of demand for domestically produced goods (total demand = 100) (continued)

(Industry Sectors)			190	302	303	304	305+306	310
					Gross	Net	Exports	
		Total	Private	Covern.	Fixed	Change	of	
		Interm.	Consump-	Consump-	Capital	in	Goods/	Total
Nr.	Sector	Output	tion	tion	Form.	Stocks	Serv.	Demand
57	Fertilisers	86.45	.87	0.00	0.00	4.55	8.12	100.00
58	Paints	104.59	.90	0.00	0.00	-5.57	.07	100.00
59	Drugs and medicines	33.92	49.66	8.12	0.00	.25	8.04	100.00
60	Soaps and cosmetics	27.42	68.87	.23	0.00	3.44	.04	100.00
61	Other chemical products	27.28	65.89	4.61	0.00	.09	2.12	100.00
62	Pesticides	72.83	19.61	11.47	0.00	-3.95	.04	100.00
63	Petroleum refin./lng.	26.55	4.18	2.54	0.00	.14	66.59	100.00
64	Lubric., grease oil	93.35	4.17	2.77	0.00	- .30	.01	100.00
65	Other petrol. products	85.81	2.54	0.00	0.00	9.01	2.64	100.00
66	Tyres and tubes	88.35	0.00	0.00	0.00	11.49	.15	100.00
67	Other rubber products	31.64	46.32	8.29	3.03	10.55	.17	100.00
68	Plastic products	63.71	33.62	5.45	0.00	-3.09	.31	100.00
69	Ceramics, earthenware	66.01	21.75	.67	11.49	0.00	.08	100.00
70	Glass, glass products	83.88	.99	3.94	4.04	.35	6.81	100.00
71	Structur. clay products	99.73	0.00	0.00	0.00	.21	.06	100.00
72	Cement	89.08	0.00	0.00	0.00	6.85	4.07	100.00
73	Other building materials	98.15	0.00	0.00	0.00	.72	1.14	100.00
74	Basic metals	70.38	0.00	0.00	0.00	.82	28.80	100.00
75	Metal products	79.11	6.21	2.30	11.90	.29	.20	100.00
76	Metal furn./fixtures	29.83	17.73	5.08	47.27	.07	.03	100.00
77	Structur. metal products	102.57	0.00	0.00	0.00	-4.71	2.19	100.00
78	Machinery, repair	36.82	4.68	5.06	30.23	22.60	.61	100.00
79	Radio, TV, appliances	41.07	19.55	2.62	5.12	1.34	30.29	100.00
80	Elec. app. nec., repair	62.26	9.37	11.86	5.40	10.49	.62	100.00
81	Accum./dry batteries	22.99	41.89	17.29	0.00	14.11	3.71	100.00
82	Ship build./repair	23.76	0.00	2.96	73.12	.00	.15	100.00
83	Railroad equip./repair	49.58	0.00	0.00	41.20	9.22	0.00	100.00
84	Motor vehicles	10.69	34.54	7.55	46.22	.79	.20	100.00
85	Motorcycles, byciles	29.32	55.04	9.20	4.05	2.38	.01	100.00
86	Repair of vehicles	83.83	5.29	10.87	0.00	0.00	0.00	100.00
87	Aircraft, repair	25.55	0.00	17.48	51.10	4.19	1.68	100.00
88	Profess./scientf. pr.	40.26	20.34	3.94	11.30	19.42	4.74	100.00
89	Mus. inst., sports pr.	45.49	25.39	10.45	8.98	5.55	4.13	100.00
90	Manufacturing nec.	26.31	49.37	22.56	0.00	-.54	2.30	100.00

Source: Ministry of Industry/NEI, op.cit.

Intermediate import requirements for industry
(excluding petroleum refining/LNG.)

87	Aircraft, repair	.6437
79	Radio, TV, appliances	.5868
68	Plastic products	.5499
77	Structur. metal products	.5337
78	Machinery, repair	.5300
83	Railroad equipment/repair	.5290
85	Motocycles, bycicles	.5198
43	Textiles finishing	.5189
54	Paper products	.5183
45	Knitting	.5108
88	Professional/scientific products	.5082
80	Electrical app. nec., repair	.5069
84	Motor vehicles	.5009
59	Drugs and medicines	.4887
55	Printing, publishing	.4879
58	Paints	.4878
61	Other chemical products	.4586
41	Spinning	.4541
76	Metal furn./fixtures	.4482
47	Carpets, rugs, ropes	.4374
62	Pesticides	.4129
53	Pulp and paper	.4097
75	Metal products	.3964
42	Weaving	.3951
60	Soaps and cosmetics	.3885
70	Glass, glass products	.3816
57	Fertilisers	.3686
81	Accum./dry batteries	.3645
33	Cocoa, choc., sugar	.3609
66	Tyres and tubes	.3540
56	Basic chemicals	.3444
44	Batik	.3363
46	Made-up textile g.	.3305
86	Repair of vehicles	.2956
67	Other rubber products	.2914
23	Dairy products	.2837
36	Soya bean processing	.2778
74	Basic metals	.2512
65	Other petroleum products	.2490
89	Mus. instruments, sports products	.2431
82	Ship building/repair	.2310
69	Ceramics, earthenware	.2194
24	Fruits/veget. proc.	.2152
90	Manufacturing nec.	.1780
38	Alcoholic beverages	.1610
39	Soft drinks	.1521
77	Cement	.1422
49	Leather products	.1421

Intermediate import requirements for industry
(excluding petroleum refining/LNG.)

40	Cigarettes	.1415
51	Wood and cork	.1370
48	Tann./leather proc.	.1287
64	Lubric., grease oil	.1132
73	Other building materials	.1098
52	Furniture, fixtures	.1030
13	Processed tobacco	.1013
27	Other veget./an. oil	.1012
26	Coconut cook. oil	.0771
37	Other food products	.0681
30	Sugar	.0630
31	Bakery products	.0607
21	Structur. clay products	.0540
50	Sawm. and other proc.	.0519
35	Tea processing	.0507
25	Fish processing	.0476
22	Meat processing	.0413
9	Rubber	.0334
17	Sawmilling in forest	.0318
11	Copra	.0315
18	Drying, salting fish	.0301
14	Farm proc. coffee	.0285
12	Farm coconut oil	.0284
34	Coffee grinding	.0280
28	Rice milling	.0260
10	Brown sugar	.0234
8	Cassava products	.0215
15	Farm proc. tea	.0207
7	Handpounded rice	.0200
16	Slaughtering	.0134
32	Noodles/macaroni	-.0670
29	Grain mill products	-.2639

Source: Ministry of Industry/NEI, op. cit.

Annex Table 40

Intermediate import requirements for groups of industries

Type of industries	Import requirements [a/]
Intermediate	
currently produced domestically	0.219
currently imported	0.409
Consumer goods	
currently produced domestically	0.387
currently imported	0.392
Capital goods	
currently produced domestically	0.399
currently imported	0.517
Exports	0.137

Source: Ministry of Industry/NEI, "Structural Analysis of the Indonesian Manufacturing Sector", Rotterdam, February 1983.

a/ Import requirements resulting from intermediate deliveries.

Annex Table 41

Projections of incremental capital and labour force requirements in manufacturing with special reference to metal sectors; 1980-1990

ISIC	Labour coeff. 1980 (Rp 10^9/ manyear)	Employment elasticity	Employment increase 1980-1990 scen.a (x1000)	scen.b (x1000)	ICOR	Increm. capital requirements 1980-1990 scen.a (Rp 10^9)	scen.b (Rp 10^9)
		Projections 1990					
371	26	0.05	2	1	6.0	8,616	4,596
372	50	0.10	6	5	4.0	5,000	3,748
381	403	0.55	187	203	0.6	507	549
382	135	0.35	48	31	0.8	821	518
383	121	0.65	48	64	0.5	308	410
384	118	0.15	52	41	1.0	2,928	2,342
3849	286	0.40	112	112	0.4	392	392
OM	329	0.26 (0.43)	1,130	2,074	1.1 (0.7)	14,116	9,907
TOTAL	272	0.30 (0.42)	1,785	2,531	1.5 (1.0)	32,688	22,462

Source: NEI calculations.

1) The figure between brackets applies to scenario (b), the other figure to scenario (a).

Note:

1. Labour coefficients were derived from more detailed labour-output ratio's presented in Ministry of Industry/NEI, "Structural Analysis of the Indonesian Manufacturing Sector", Rotterdam, February, 1983.

2. Employment elasticities were obtained from data presented in BPS, Industrial Surveys, for 1975 and 1980. The output data from this source were converted in constant prices through application of sectoral wholesale price indices for manufacturing.

3. Capital-output ratios were, among others, obtained from data from: Ministry of Industry/NEI, "Project Mankap DTA-193: Harmonisation report", Jakarta/Rotterdam, 1983.

Annex Table 42

Projections of incremental direct intermediate import requirements and incremental manufacturing sector with special reference to metal industries; 1980-1990

ISIC	Import share 1980 a/	Projections increm. import requirements 1980-1990		Value added share 1980 b/	Projections increm. value added 1980-1990	
		scen. a	scen. b		scen. a	scen. b
371	0.35	503	268	0.28	402	214
372	0.05	63	47	0.28	350	262
381	0.51	431	467	0.25	211	229
382	0.68	698	441	0.25	257	162
383	0.66	406	541	0.23	141	189
384	0.58	1,698	1,358	0.33	966	773
3849	0.15	147	147	0.22	216	216
OM	0.30 (0.25)	3,932	3,634	0.31 (0.30)	4,127	4,490
Total	0.36 (0.31)	7,878	6,903	0.30 (0.29)	6,670	6,535

Source: NEI calculations.

a/ Share of imported inputs in production.
b/ Share of value added at factor prices in production.

Annex Table 43

Labour-intensity of groups of industries

Type of industries	Labour intensity [a]
Intermediates	
currently produced domestically	736.5
currently imported	283.9
Consumer goods	
currently produced domestically	464.4
currently imported	441.3
Capital goods	
currently produced domestically	367.1
currently imported	303.2
Exports	594.9
Natural-resource processing industries	1,613.1
Large scale sector	235.3
Mixed sectors	793.8
Small scale sectors	834.0

Source: Ministry of Industry/NEI, "Structural Analysis of the Indonesian Manufacturing Sector", Rotterdam, February 1980.

a/ Manyears per Rp. billion of domestic final demand.

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INDONESIA

Part III. Survey of Capital Goods and Engineering Industries

Prepared by the

Regional and Country Studies Branch
Division for Industrial Studies

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The UNIDO INDONESIA INDUSTRY SECTOR STUDY comprises the following six parts:

THIS DOCUMENT CONTAINS PART III.

Part III. Survey of Capital Goods and Engineering Industries

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Chapter I. An Overview

Capital goods constitute an important part of engineering goods industries classified under ISIC 38 "Fabricated metal products, machinery and equipment". The engineering sector includes five main industrial groups: fabricated metal products (ISIC 381); machinery, except electrical (382); electrical machinery (383); transport equipment (384), and professional scientific and photographic equipment (385). Manufacture of parts and components as well as assembly cperations are included in the engineering industry.

Viewed as a group, the engineering industry is one of the most heterogeneous branches within the entire manufacturing sector. It is composed of a wide range of manufactured products, parts and components covering both consumer durables (cutlery, radios, TV-sets, electrical household goods, motor cycles, private passenger cars); intermediate goods (parts and components for assembly operations) and all capital goods (machinery, plant equipment, metal products and some transport equipment).[1/] The distinction is important because market conditions and production processes vary widely among products depending upon whether demand is consumer oriented (both household and government consumption) or dependent upon investment demand. Policy approaches to the three product groups may also be quite different.

Indonesian industrial statistics do not permit an exact statistical definition of capital goods. Ideally such definition ought to be based upon ISIC 38, but "sifted" for consumer durables and intermediate goods. A broad estimate however may be derived from the provisional 1980 input-output table, which contains information on the structure of production according to major demand components (Table I.1). The input-output table distinguishes between: inputs into gross fixed capital formation which may serve as an approximation for capital goods; for intermediate output; and for private (household) and government consumption, which may be equated with consumer durables. Based

1/ The distinction between consumer durables and capital goods is by no means always clear, since some products, for example sewing machines, can be either consumer goods (for private use) or capital goods (for use in textile industry).

upon Table I.1 an estimate may be derived of the distribution of capital, intermediate and consumer durables within the engineering industries. Accordingly the (weighted) share of capital goods within the engineering goods industry (ISIC 38) is estimated at 28.2 per cent while that of consumer goods is put at 21.5 per cent of total production. Noteworthy is the high share of intermediate goods of 50.3 per cent, primarily consisting of production of materials (such as metal products), semi fabricated products (such as steel rods, wires), components and parts as well as sub-assemblies, sub-contracting and repair. These intermediate goods, in turn, serve as inputs into the capital goods or consumer durable producting industries.

Table I.1: Component shares of domesticaly produced goods, 1980

ISIC	Sector	Intermediate Output	Private consumption	Government consumption	Gross fixed capital formation	Change in Stock	Export	Total Production
		Percentage						
381	Metal products	71.59	7.78	2.48	18.53	-1.03	0.66	100.0
382,383	Machinery and repair	39.02	11.67	5.93	19.39	15.36	8.73	100.0
384	Transport equipment	33.92	20.28	7.76	37.19	0.69	0.16	100.0
38	Total (excl. 38)	-	-	-	-	-	-	-

Source: Provisional Input-output Table, 1980.

Assuming, that capital goods account for around 28.2 per cent of all engineering goods which in turn account for 17.0 per cent of total manufacturing gross output, it follows that the share of capital goods within the Indonesian manufacturing sector was about 5 per cent of gross output in 1980. While this figure undoubtedly is only indicative, it may be claimed that an "embryonic" capital goods industry has emerged in recent years.

Since an operational statistical definition of the capital goods industry is not feasible, this chapter will initially survey the entire engineering goods industry (ISIC 38) and subsequently place particular emphasis upon those sub-groups which encompass most capital goods, namely, non-electrical machinery and equipment (382), electrical machinery (383) and metal products (ISIC 381). The key focus of the analysis will be on capital goods intended for industrial use, especially plant processing equipment and machinery (ISIC 382). These products are inter alia required for processing raw materials from agriculture and forestry into semi-finished and finished products. Additional information is provided on the iron and steel sector (ISIC 371) which supplies part of an important raw material for the engineering industry.

This broad approach to analysing the capital goods industry is useful since there is a potential for substitution in the product-mix among many sub-groups within the engineering industry. The survey would therefore be indicative of the potential base for development of the capital goods industry in general.

Chapter II. Structure and Performance of Capital Goods and Engineering Industry

Overall performance

The capital goods and engineering industry ranks among the fastest growing industries within the entire Indonesian manufacturing sector. During the period 1970-80 value added of the engineering industry grew at 17.6 per cent annually compared with 11.8 per cent for the whole manufacturing sector. Table II.1 shows that particularly high growth of value added was recorded for electric assembly, which grew at an average annual rate of close to 30 per cent during the 1970s followed by non-electrical machinery (27.6 per cent) and metal products (20.2 per cent). During the same period the number of medium and large scale engineering enterprises grew from 255 to 811 enterprises (Annex Table 4). This rapid growth, which was in part related to the low initial base, but also owed something to favourable developments in the national economy raised the share of engineering goods in total manufacturing value added from 6.1 per cent in 1970 to 16.9 per cent in 1980.

Table II.1: Value added, employment and labour productivity in capital goods and engineering industries 1970 - 1980

ISIC	Average annual growth 1970-1980 MVA[a]	Em-ploy-ment	Share of value added in total manufac-turing 1971	1980	Share of Employment in total manufac-turing 1970	1980	Value added per em-ployee 1980 (000 US $)	Contribution to overall employment growth of total manufacturing 1970-80
381 fabricated metal products	20.2	11.5	2.3	3.5	2.8	4.2	2.9	5.7
382 Machinery, except electrical	19.5	10.5	0.4	1.6	0.9	1.2	4.5	1.6
383 Electrical machinery	30.8	27.1	2.5	5.3	0.7	3.9	4.8	7.1
384 Transport equipment	5.6	16.6	0.9	6.4	1.3	3.1	7.3	5.1
385 Scientific and profes-sional equip.	12.0[b]	-	0.0	0.1	0.0	0.1	2.2	2.1
ISIC 38 sub-total	17.6	15.8	6.1	16.9	5.8	12.6	4.7	21.6
Total manufac.	11.8	7.1	100.0	100.0	100.0	100.0	3.5	100.0

Source: Part II, Tables II.4; II.5 and Annex Table 11.

a/ Trend real growth rates based on estimated index numbers for value added for the entire industry as provided by UN Statistical Office, New York.
b/ 1970-1976.

The most important subgroups within the engineering industry in 1980 were transport equipment (6.4 per cent of total manufacturing value added) electrical machinery (5.3 per cent) and metal products (3.5 per cent). The non-electrical machinery industry, which accounted for only 1.6 per cent of total manufacturing value added, has lagged behind in growth of other engineering industries. The production of plant equipment included in this category is still very small. Noteworthy is the small size of the professional and scientific equipment sector (0.1 per cent).

Employment, labour productivity and labour intensity[1/]

The contribution of the engineering industry tc employment creation has been quite impressive, which is indicative of the labour intensive nature of many of these manufacturing activities. During the priod 1970-80 employment in the large and medium-scale engineering industry grew by 15.8 per cent annually. In absolute terms employment in the enginering industry grew by 93,050 persons from 27,950 in 1970 to 121,000 in 1980, which corresponds to 21.6 per cent of the overall increase in employment of the entire manufacturing sector during the 1970s. Concomitantly the share of engineering industries in total manufacturing employment grew from 5.8 per cent in 1970 to 12.6 per cent in 1980. Employment grew substantially in electrical machinery by 27.1 per cent average annual rate of growth from 1970-80, followed by transport equipment (16.6 per cent), metal products (11.5 per cent) and non-electrical machinery (10.5 per cent).

Labour productivity in the engineering industries, especially in the automotive and electrical machinery industries, is generally higher than in the manufacturing sector as a whole. This may be due to the circumstances that many engineering products are sold in protected markets and the fact that productivity in the overall manufacturing sector is somewhat depressed by the low productivity of traditional industries. The highest levels of labour productivity were in the following sub-sectors: motor cycles and three wheel vehicles, motor vehicle manufacture and assembly, electrical apparatus and supplies, and storage batteries (Annex Table 10).

The scanty data available on skill composition of the labour force in the engineering industry suggests that the majority is unskilled. The number of skilled workers, technical and engineering personnel is very small. This lack of skilled labour severely restricts the range of products that can be produced in Indonesia. Skill development is therefore one of the major prerequisites for further development of these industries.

1/ Factor intensities in the engineering industry (ISIC 38) are discussed in Part II.

Table II.2 Number of establishments, persons engaged, and average size of establishment, ISIC 271 iron and steel basic industries and ISIC 38 metal products, machinery and equipment, 1975, 1980 and 1981

ISIC		Number of Establishments			Number of Persons Engaged						Number of Persons Per Establishment		
					1975		1980		1981				
		1975	1980	1981	Number	%	Number	%	Number	%	1975	1980	1981
371	Iron and Steel Industries	13	23	22	2,883	-	8,822	-	9,483	-	222	384	431
381	Metal Products	282	363	355	22,434	36.5	41,055	33.8	44,037	33.2	80	113	124
382	Non-electrical Machinery	98	132	128	8,833	14.4	12,055	9.9	12,658	9.6	90	91	99
383	Electrical Machinery	77	113	115	10,463	17.0	37,388	30.8	38,778	29.3	136	331	337
384	Transport Equipment	118	178	188	19,356	31.4	29,991	24.7	35,949	27.1	254	168	207
385	Scientific, Photographic Equipment	15	25	27	460	0.7	990	0.8	1,023	0.8	66	40	38
	Total ISIC 38	590	811	813	61,546	100.0	121,479	100.0	132,445	100.0	104	150	163

Source: Survey of Manufacturing Industries, BPS, Indonesia, 1975, 1980 and 1981.
See also Annex Tables 4 and 5.

Information on labour intensity provided in Table II.3 shows that the share of wages and salares in value added in the engineering goods industry was 29.2 per cent in 1975. By 1980 the share had fallen to 22.8 per cent and in 1981 even f··rther to 20.0 per cent. This decline was entirely due to a drastic fall in labour intensity in the transport equipment sector from 36 per cent in 1975 to 14 per cent in 1981. In other words there was a substantial increase in capital intensity and/or profit in this sector, particularly in motor vehicle assembly and manufacture, ship building and repair. However labour intensity did not decline in other engineering sectors and remained high particularly in the following sub-groups: kitchen apparatus, transport equipment n.e.c., scientific equipment, dry cell batteries, bicycle, becak assembly and manufacture, metal containers, and motor vehicle body and equipment. (Annex Table 9).

Table II.3: Value added, share of wages and salaries in value added and value added per employee, 1975, 1980 and 1981
(values in current prices)

ISIC	Value Added (billion Rp.)						Share of Wages and Salaries in Value Added			Value Added per employee 1981
	1975		1980		1981					
	Value Added	Percentage	Value added	Percentage	Value Added	Percentage	1975	1980	1981	
							---Percentage---			(000 Rp.)
371 Iron and Steel Industries	1.1	-	70.0	-	79.5		32	13	12	8,383
381 Metal products	16.9	26.5	74.2	20.7	85.4	16.1	32	29	33	1,939
382 Non-electrical mach.	8.0	12.6	33.4	9.3	42.9	8.1	24	24	24	3,389
383 Electrical machinery	18.3	28.7	112.6	31.5	125.9	23.6	20	22	23	3,247
384 Transport equipment	20.3	31.9	136.2	38.1	277.8	52.1	36	20	14	7,728
385 Scientific, Photographic equipment	0.2	0.3	1.4	0.4	0.7	0.1	40	26	56	684
Total ISIC 38	63.7	100.0	357.8	100.0	533.0	100.0	29.2	22.8	20.0	4,025

Source: Survey of Manufacturing Industries, BPS, Indonesia, 1975, 1980 and 1981.
See also Annex Tables 1, 2, 3, 6, 7, 8 and 11.

Geographical location

The geographical concentration of engineering enterprises follows the general pattern of the overall manufacturing sector. Table II.4 show that most engineering enterprises, around 86 per cent, are located in Java. Almost one-third of the 790 enterprises in operation in 1981 were located in Jakarta (258 enterprises). Almost one-fourth, or 174 enterprises, were concentrated in East Java, while another 141 enterprises were located in West Java, 95 in Central Java and 11 in Yogyakarta. Outside Java there were a few enterprises in Sumatra (71 enterprises), but in the other regions the incidence of any organised engineering industry is very restricted.

Table II.4: Location of engineering enterprises 1981
(ISIC 38 except 385)

ISIC	Jakarta	East Java	West Java	Central Java	Yogykarta	Sumatra	Sulawesi	Kalimantan	Others	Total
	---Number of Enterprises---									
381 Fabricated metal products	125	93	45	33	8	34	8	1	8	355
382 Machinery, except elec.	20	30	34	30	1	13	0	0	0	128
383 Electrical machinery	55	10	34	9	1	6	0	0	0	115
384 Transport equipment	58	41	28	23	1	18	5	7	11	192 a/
Total	258	174	141	95	11	71	13	8	19	790

Source: BPS (unpublished data) (Annex Tables 12-17).
a/ Alternative figure reported: Table II.2 (188).

Size structure of enterprises

The average plant size of engineering enterprises has increased from 104 persons per establishment in 1975 to 163 in 1981 (Table II.2). Industrial enterprises are particularly large in the electrical machinery and transport equipment industries especially in the following sub-groups: dry cell batteries, motor cycles, 3 wheel vehicles, radio, TV-sets, communication equipment, motor vehicle assembly and manufacture, and electrical apparatus and supplies (Annex Table 4). These are mainly assembly operations characterised by large production runs, standardised products and economies of scale.

Table II.5 contains additional information on the distribution of engineering output and employment by size class in 1979. The table reveals that small scale and cottage enterprises are important in regard to production of metal furniture, fixtures and in the production of agricultural hand tools, cutlery, screws and bolts, kitchen appartus, metal containers and metal products n.e.c. Undoubtedly many of these small-scale industrial activities provide a breeding ground for entrepeneurial activities and skill development required by medium and large enterprises. Many small industries could enter into foster parent relationships with medium- and large-scale enterprises through sub-contracting arrangements, training schemes and thus expand their operations and gradually be upgraded to medium-scale enterprises.

Ownership pattern

Recent data on ownership structure based upon a sample survey of 96 enterprises shows that local non-pribumi enterprise is the predominant ownership form in all engineering industries, particularly in electrical machinery (50.0 per cent of all enterprises), metal products (38.5 per cent), transport equipment (35.7 per cent) and non-electronical machinery (27.3 per cent) (Table II.6).

The second most important ownership category is pribumi enterprises which play a crucial role in the fields of transport equipment (35.7 per cent), non-electrical machinery (27.3 per cent) and fabricated metal products (26.9 per cent). The role of pribumi enterprises however is limited in electrical machinery.

Most Government enterprises operate in transport equipment and non-electrical machinery industries. In these branches, they account for around one-fourth of all enterprises of the sample surveyed.

Foreign enterprises are important in electrical machinery, metal products and non-electrical machinery. Their share of the number of enterprises in these branches lies between 23 and 30 per cent.

Table II.5: Engineering industry: distribution of output and employment by size class of industry, 1979
(output in million Rp.)

Sector Code[a/] ISIC	Output				Employment				Share of Small Enterprises + Household and Cottage Enterprises output	Share of Small Enterprises + Household and Cottage Enterprises Empl.	Size classification[b/]
	Medium and Large Enterprises	Small Enterprises	Household and Cottage Enterprises	Total	Medium and Large Enterprises	Small Enterprises	Household and Cottage Enterprises	Total			
	----million Rp.----				----number----				----percentage----		
38111/2/3/4/40/90	64,903	13,007	6,928	84,838	21,713	19,820	20,639	62,172	23	65	M
38120	3,165	5,136	3,961	12,262	2,025	4,314	6,400	12,739	74	84	S
38130	116,279	3,019	-	119,298	11,769	2,311	-	14,080	3	16	L
38200/330	129,474	2,761	-	132,235	23,879	3,112	-	26,991	2	12	L
38320	114,537	172	-	114,709	9,379	95	-	9,474	--	1	L
38340	496	10	-	506	204	19	-	223	2	9	L
38311/2	41,457	707	--	42,164	5,677	270	-	5,947	2	5	L
38411	24,046	3,131	1,060	28,237	6,912	2,524	2,042	11,478	15	40	L
	n.a.	n.a.	n.a.	-	n.a.	n.a.	n.a.	-	--	--	L
38430	75,825	1,506	-	77,331	9,706	1,186	-	10,892	2	11	L
38440/50	109,350	1,465	-	110,815	6,655	1,245	-	7,900	1	16	L
	n.a.	n.a.	n.a.	-	n.a.	n.a.	n.a.	-	--	--	M
38500	1,900	1,277	-	3,177	791	912	-	1,703	40	54	M
Total 38	681,432	32,191	11,949	725,572	98,710	35,808	29,081	163,599			

Source: BPS, Industrial Survey, 1974, 1979.
Survey of Small Scale Industries, 1979 (tentative results)
NEI calculations

n.a. = not available.

a/ See explanatory note in Annex.
b/ M = medium enterprises
L = large enterprises
S = small enterprises.

Table II.6: Percentage breakdown of establishments by dominant ownership category 1980

Sector	Number of reporting Establishments	Foreign[a/]	Government[b/]	Local Non-Pribumi[c/]	Pribumi[d/]
	---Number---	---------Percentage Share--------			
381 Fabricated metal products, except machinery and equipment	26	23.0	11.6	38.5	26.9
382 Machinery, except electrical	22	22.7	22.7	27.3	27.3
383 Electrical machinery	20	30.0	5.0	50.0	15.0
384 Transport equipment	28	3.6	25.0	35.7	35.7

Source: MANKAP survey, 1980.

a/ "Foreign" if foreign participation in equity is at least 20 per cent.
b/ "Government" if not "Foreign" and if Government participation in equity is at least 20 per cent.
c/ If neither "Foreign" nor "Government" and if equity participation is reported to be predominantly by local non-indigenous persons.
d/ Remaining cases.

Investment

The proportion of gross fixed capital formation in the manufacturing sector channeled into the engineering industry increased from 8.0 per cent in 1970 to 13.3 per cent in 1980. The data presented in Table II.7 on gross fixed capital information in the engineering industry shows that large investments were channeled into the transport equipment and metal products industry as well as the electrical machinery industry. Investment in the non-electrical machinery industry, which accounted for only 5.9 per cent of gross fixed capital formation in the entire engineering industry in 1980 increased to 13.1 per cent in 1981. The low investment activity in this branch during the second half of the 1970s explains in part the lagging performance of this industry. Major investments have thus been channeled into assembly operations while investments in plant equipment and machinery for processing agricultural products, wood products, textile manufacture, etc. have been very meagre.

Table II.7: Gross fixed capital formation in ISIC 38 metal products, machinery and equipment 1975, 1980, 1981
(million Rp.)

ISIC	1975		1980		1981	
	Million Rp.	%	Million Rp.	%	Million Rp.	%
381 Metal Product	9,190	29.3	20,345	33.7	18,428	23.8
382 Non-electrical machinery	1,338	4.3	3,544	5.9	10,173	13.1
383 Electrical machinery	4,070	13.0	16,015	26.5	24,009	31.0
384 Transport equipment	16,760	53.3	20,341	33.7	24,798	32.0
385 Scientific, Photographic equipment	11	0.1	119	0.2	164	0.2
38 Total ISIC	31,369	100.0	60,364	100.0	77,572	100

Source: Survey of Manufacturing Industries, BPS, Indonesia, 1975, 1980 and 1981.

Considerable foreign investment activity occurred in the metal products industry. The amount of approved foreign investment by the BKPM (Investment Co-ordinating Board) since 1967 was US $711.5 million. However, owing to the often considerable gestation period of some investment and the postponement and/or cancellation of a few large scale projects, only US $512 million (102 projects) were implemented during the same period. This represented 18.0 per cent of all foreign investment implemented in the manufacturing sector (Table II.8).

In the basic metals industry the amount of approved foreign investment was considerably higher, US $2,060 million. However, since a few very large approved projects did not come into fruition the low implementation ratio of 12.5 per cent resulted in only US $256.7 million of implemented foreign investment.

Table II.8: Approved and implemented foreign investment in the basic metals and metal products sector, 1967-1981

	1967-75	1976	1977	1978	1979	1980	1981	Total 1967-75 Value	Total 1967-75 Projects (Number)
Approved foreign investments million US $									
-basic metals	1,084.9	11.6	18.4	9.9	854.9	...	80.6	2,060.3	23
-metal products	198.8	61.5	72.5	92.0	45.1	98.8	142.8	711.5	126
Implemented foreign investments million US $									
-basic metals	81.1	30.7	27.8	37.8	47.5	23.9	7.9	256.7	19
-metal products	221.0	42.4	35.4	89.9	36.0	52.0	35.3	512.0	102
Implementation ratio (%)									
-basic metals	8	-	-	-	-	-	-	12.5	-
-metal prod.	112	-	-	-	-	-	-	72.0	-
Implemented foreign investment as % of total manufacturing									
-basic metals	5.7	10.2	15.0	14.2	24.7	10.2	3.2	9.0	-
-metal products	15.5	14.1	19.0	33.7	18.8	22.1	14.5	18.0	-
Foreign investment as % of total foreign investment implemented									
-basic metals	3.6	7.2	10.7	9.3	14.9	6.9	2.1	5.8	
-metal prod.	9.7	10.0	13.7	22.2	11.3	15.0	9.3	11.6	

Source: Bank Indonesia, Report for the Financial Year 1981/82.

Import dependence[1/]

In 1980 Indonesia's imports of machinery and equipment (SITC 7) amounted to US $3,633.8 million which is close to two-fifths of total manufactured imports. Some of the simpler machinery and equipment products are obvious candidates for import substitution provided feasibility studies prove that they are economically viable and can be efficiently produced at or near internationally competitive prices in Indonesia.

Export of machinery and equipment is extremely limited and almost exclusively confined to electronic components. In 1980 exports of electrical

1/ Industrial linkages are discussed in Part II of the Industry Sector Study.

machinery amounted to US $108.9 million which corresponds to 3.7 per cent of total manufactured exports.

Domestic demand for machinery and equipment is therefore overwhelmingly met by imports. It is estimated that the share of imports in apparent consumption of machinery and equipment is 66 per cent. Domestic production is almost exclusively oriented towards the domestic market, its share of apparent consumption is estimated at 34 per cent. In 1980 domestic production of the entire engineering industry was 1,159 billion rupiahs which compares with imports in the magnitude of 2,277.5 billion rupiahs.[1/] Thus in 1980 Indonesia's imports of machinery and equipment was almost double the value of its domestic production.

Since much of the present engineering production consists of assembly operation, the incidence of import dependence of machinery and equipment is particularly high in regard to intermediate goods viz parts, components and other inputs. In 1980 the share of imported raw materials and components in relation to total raw material requirements of the engineering goods industry was 76.1 per cent. Import dependence was particularly high (above average) in the following sub-groups: storage batteries; dry cell batteries; radio, TV. communication equipment; structural metal products; non-electrical machinery; metal containers; motor vehicle assembly and manufacture (Table II.9).

Domestic supplies to the engineering goods industry, however, were important for some sub-groups. For example the domestic industry supplied more than half of all raw material requirements in the following sub-groups: repairs of electrical equipment; cutlery screws, bolts; manufacture of professional and scientific equipment; ship-building and repairs; and bicycle and becak assembly and manufacture.

1/ Exchange rate conversion US $1 = Rupiah 626.75.

Table II.9: Reliance on imported raw materials, engineering industries, ISIC (38) 1980.

ISIC		Imported Raw Materials and Components as Percent of Total Raw Materials
37100	Iron and Steel Basic Industry	58.0
38111	Agriculture, hand tools	60.0
38112	Cutlery, screws, bolts	20.3
38113	Kitchen apparatus	65.6
38120	Metal furniture and fixture	37.6
38130	Structural metal products	86.6
38140	Metal containers	81.9
38190	Metal products n.e.c.	61.4
38200	Machinery and repair	82.6
38311	Storage batteries	96.1
38312	Dry cell batteries	89.7
38320	Radio, TV, communication equip.	87.9
38330	Elec. apparatur/supplies	75.2
38340	Repair of elec. appl.	18.2
38411	Shipbuilding and repair	45.4
38430	Motor vehicles ass./manu.	81.2
38440	Motor cycle/3 wheel veh.	64.7
38450	Bicycle, becak ass./manu.	49.7
38460	Motor vehicle body + equipment	57.5
38490	Transport equip. n.e.c.	59.2
38500	Manu. of scientific equip.	34.9
38	Metal products, machinery + equipment	76.1

Source: Survey of Industries, BPS, Indonesia, Vol. II, 1980.

Chapter III. Review of Key Capital Goods Industries

The following review highlights the main features of those engineering goods industries which contain predominantly capital goods for industrial use, particularly non-electrical machinery, as well as electrical machinery and fabricated metal products.

Non-electrical machinery (ISIC 382)

The non-electrical machinery branch consists of the following subgroups: engines and turbines; agricultural machinery and equipment; metal and wood working machinery; special machinery and equipment; office, computing and accounting machinery; and other non-electrical machinery and equipment.

Most capital goods for industrial use are included in the non-electrical machinery branch which is the smallest of the three key industries. In 1981 there were 128 enterprises providing employment for 12,700 implying an average size of 99 employees per enterprise. The branch's share of total manufacturing value added and employment was 1.6 per cent and 1.2 per cent respectively in 1980. Value added and employment grew rapidly at a rate of 19.5 per cent (1970-80) and 10.5 per cent (1970-80) respectively, which is indicative of a very substantial improvement of labour productivity.

The non-electrical machinery branch has lagged behind the growth of other engineering industries from 1975-1980 as reflected in its declining share of employment, output and value added within the engineering industry. There was however a significant increase in investment and value added from 1980-1981. The reasons for the lagging performance can be traced to the meagre investments resources channeled into this branch and the inherent supply problems. Undoubtedly these problems are routed in lack of skilled labour; insufficient marketing and management skills and inadequate technological capacity. Only very few enterprises have the capability of manufacturing complete parts of products. The quality of products is generally poor and production is greatly dependent upon imports of parts of complete products.

Table III.1 depicts the emergence of an embryonic capital goods industry producing plant equipment and machinery for agricultural processing industries. These capital goods include *inter alia* sugar cane milling machines, rice press machines, corn grinders, coconut oil milling machines, coffee milling machines, tea processing machines, rice press machines, as well as weaving machines, rubber machines and brick processing machines. However, the extremely low unit value of many items is suspicious and points towards the predominance of assembly operations and/or repair activities, while the actual fabrication of complete products is still limited.

Table III.1: Domestic production and repair of non-electric machinery and equipment (ISIC 382) in Indonesia, 1980

Machinery	Unit	Physical Production	Value (000 Rp.)	Unit Value (000 Rp.)
Generator	unit	58,075	26,369,491	454.1
Radiator	unit	130	4,231,169	32,547.5
Stone crusher	ton	102	1,300,500	12,750.0
Generator sets	set	1,645	962,549	585.1
Cranes	unit	37	673,719	18,208.6
Tile press	set	2,578	207,540	80.5
Tile roofing machines	set	206	181,902	883.0
Rice press machines	set	451	175,891	390.0
Tile press machines	set	250	153,000	612.0
Tea processing machines	unit	27	142,598	5,281.4
Mixing machinery	set	37	77,000	2,081.1
Rubber machinery	ton	27	60,937	2,256.9
Sugar cane milling machines	ton	241	58,319	242.0
Brick processing machines	number	1,002	47,600	47.5
Weaving machine apparatus	number	5,205	45,018	8.6
Rubber rollers machines	number	33	35,600	1,078.8
Sondir/special machines	number	24	28,800	1,200.0
Corn grinder mill	number	142	22,120	155.8
Coconut oil milling machines	number	40	21,000	525.0
Brick pressing machine	number	3	17,000	5,666.7
Maize press/roller machines	set	134	16,623	121.8
Tapioca milling machines	set	2	15,000	7,500.0
Moulding machines	number	75	11,250	150.0
Kloss machines	number	15	11,250	750.0
Finishing textile machinery	unit	12	11,100	925.0
Saw machines	unit	1	9,000	9,000.0
Coffee milling	number	33	8,500	257.6
Excenter press machines	number	13	1,500	115.4
Bean curd processing machines	number	7	980	140.0
Chili processing machines	number	2	270	135.0
Other machines	-	-	18,429	-
Total all machines	-	-	34,915,661	-

Source: Survey of Manufacturing Industries, Indonesia, Vol.II, 1980.

Production processes in the non-electrical machinery branch are predominantly assembly activities using imported parts. The incidence of import dependence is relatively strong as reflected in the high share of imports of 82.6 per cent of total raw material requirements (Table II.9). However most intermediate goods from the basic metal industry are from domestic origin (76 per cent) except metal products serving as intermediate goods which are mainly imported with only 9.3 per cent supplied by domestic industries. The predominant use of old machines, simple tools and traditional production technology is characteristic for this branch.

Contrary to most other engineering goods industries, the average size of enterprises in this branch is relatively small, with an average of 99 persons per enterprise, which in Indonesia is at the borderline between medium and large scale enterprises. The majority of the 128 enterprises in 1981 are located in West Java (34 enterprises), followed by East Java (30 enterprises), Central Java (30 enterprises), Jakarta (20 enterprises) and North Sumatra and Riau (13 enterprises) (Annex Table 14). Many of these enterprises were initially established as agricultural supporting repair workshops. In Surabaya and the Probolinggo area in East Java they started as the service basis for the sugar industry; in Tegal, West Java, they developed as centres for supporting rice cultivation; and in the Medan area they originally supported the plantations.

Many of the workshops were originally established by the Dutch. Today the non-electrical machinery enterprises are fairly evenly distributed among pribumi (27.3 per cent of all enterprises) and non-pribumi (27.3 per cent), and between government (22.7 per cent) and foreign ownership (22.7 per cent). A majority of enterprises have the legal status of PT (Perusahaan Terbatas = limited company) while a minority, 14 per cent, have legal status of PD (Perusahaan Dagang).

All products of the non-electrical machinery branch are sold in the domestic market. The virtual absence of exports may be explained by adequate profits in protected home markets (i.e., lack of incentives to look for export markets), lack of international competitiveness (price, quality) and lack of export marketing capacity.

Government banks have so far not played any major role in providing financing for the non-electrical machinery industry. The share of working capital in total capital is high, while the levels of capital utilisation and capital coefficient are low. The non-electrical machinery sector received only a modest degree of protection against competing imports. The effective rate of protection is estimated at 18 per cent (Annex Table 19).

The potential demand for many non-electrical machinery products is growing rapidly to levels at which economic production in Indonesia may gradually be visualised. Undoubtedly there is widespread preference for purchasing imported equipment, which tends to be cheaper and of better quality. Improvement of product quality, competitiveness and marketing skills is therefore a prerequisite for the further development of this industry, which could also be supported by the procurement policy of public industrial enterprises acting as purchasers of the products of the industry.

The main problems of expanding output of non-electrical machinery are likely to be on the supply side owing to the predominant use of outdated, traditional technology and old equipment. The production of non-electrical products involves higher skills which is greatly lagging. This points to the urgent need for management training and education, on-the-job and vocational training, and special programmes to enhance skill development in general.

Electrical machinery (ISIC 383)

The electrical machinery industry branch consists of enterprises producing: storage batteries; dry cell batteries; radios, TV and communication equipment; electrical apparatus and supplies, as well as repair of electrical appliances. The most important sub-sectors are communication equipment and apparatus (3832) and electrical apparatus and supplies (3833) which include such products as radios, TV-sets, recorded casette tapes, and also integrated circuits, transformers, electrical cables, lamps and refrigerators. Obviously many of these products are consumer durables, but there are a large number of potential capital goods products.

The electrical machinery industry has emerged as the fastest growing branch within the entire engineering goods industry. Value added and employment grew at an average annual rate of 30.8 and 27.1 per cent respectively from 1970-80. Growth in labour productivity was very modest. The branch's share in total manufacturing value added and employment was 5.3 and 3.9 per cent respectively in 1980. The electrical machinery industry provided employment for close to 39,000 persons in 1981 and made the largest absolute contribution of all engineering industries to overall employment growth in manufacturing during the 1970s.

Table III.2 shows that in 1980 there was quite considerable assembly and domestic production of TVs; integrated circuits and parts; cables, wires and rods; dry cell batteries; casette and tape recorders; and radios, transceivers, high equipment (see also Annex Table 18). Obviously many of these products are consumer durables and intermediate goods but an "infant capital goods industry" also exists. Undoubtedly the established production capacity and existing skills represents a potential basis for future inclusion of capital goods in the product mix. Notable among the relatively few capital goods are: sewing machines (110,000 units); transformers (1,863,000 units); exhaust fans (31,000 sets) and electrical tools (533 million Rp.). Some of these also serve as consumer durables. The low level of capital goods production of electrical machinery reflects the technologically more complex production requirements. These products usually require more sophisticated technology than mechanical machinery.

Production processes are in most cases quite up to date. In many cases they consist of assembly operations based upon imported parts for radio and TV sets, or the assembly of completely knocked down kits (CDK-kits), usually using unskilled or semi-skilled labour. Efforts are being made to standardize products and parts in order to speed up the process of increasing the proportion of domestic content.

The majority of the 115 enterprises operating in this branch in 1981 are located in Jakarta (55 enterprises) and West Java (34 enterprises). A few enterprises are located in East Java (10), as well as Central Java and Yogyakarta (10) and Sumatra and Riau (6). These enterprises are typically large scale with an average size of 337 persons, which is double the average size of the Indonesian engineering goods industry. The average size of enterprises in the industry more than doubled since 1975. Enterprises are particularly large scale in sub-sectors producing: dry cell batteries (692 employees per enterprise); radio, TV-sets and communication equipment (448 persons per enterprise); and electrical apparatus and supplies (274 persons per enterprise) (Annex Table 4). The assembly of electronic products entails many labour intensive operations and require large production runs of relatively standardized products.

Table III.2: Domestic production of electric machinery and equipment (ISIC 383), in Indonesia, 1980

	Unit	Physical production	Value (000 Rp.)	Price per unit (Rp.)
1. TV, black and white/coloured	000 units	607	103,141,491	169,920
2. Integrated circuits and panels	000 units	487,745	52,835,488	108
3. Cables, wires and rods	tons	30,172	45,800,899	1,518,000
4. Dry cell Batteries	-	-	38,925,621	-
5. Cassette and tape recorders	000 units	29,091	33,739,484	1,160
6. Radios, transceiver, Hi-Fi	000 units	3,109	21,954,185	7,061
7. Refrigerators	000 units	82	13,248,519	161,567
8. Other cables	000 meters	121,853	11,213,519	92
9. Storage batteries (accummulator), and parts	-	-	9,373,158	-
10. Bulb and tube lamps	000 units	107,753	9,465,528	88
11. Air conditioners	000 units	37	7,985,937	215,836
12. Fans	000 unit	245	5,504,210	22,466
13. Transformers	000 units	1,863	3,826,032	2,053,000
14. Plugs, sockets, switches	000 units	11,870	3,850,878	324
15. BC	tons	1,656	2,919,108	1,763,000
16. Melamine sheets	000 sheets	603	2,413,644	4,003
17. Sewing machines	000 units	110	2,028,843	18,444
18. Trafo TL	000 units	1,929	1,027,385	533
19. PVC wires	tons	216	1,528,099	7,075,000
20. Gas appliances	000 sets	22	886,680	40,304
21. Electric tools	-	-	532,971	-
22. Rice cookers	000 sets	32	463,376	14,480
23. Condensors	000 units	501	422,243	843
24. Others	-	-	14,056,757	-
Total (gross output ISIC 383)	-	-	387,144,415	-

Source: BPS: Survey of Industries, 1980.

The predominant ownership form is non-pribumi (50 per cent of all establishments), followed by foreign ownership (30 per cent). The role of private pribumi and Government is therefore relatively modest. The majority of firms have the legal status of PT (perusahaan terbatas = limited company). Many establishments in the branch have been accorded special tax facilities.

The electrical machinery industry is the only engineering goods industry which has penetrated export markets with around 14 per cent of its production being exported. Exports of electronic components increased from US \$52.3 million in 1981 to US \$ 75.6 million in 1982. Export products are mainly integrated electrical circuits produced by domestic branches of foreign owned

(US) companies which conduct a bond processing operation i.e., import components and re-export of assembled products back to the US via Singapore and where Indonesian value added represent only about 20 per cent. Transnational corporations have therefore played a significant role in the development of exports in this industry.

Most inputs for the electrical machinery industry originate from other engineering enterprises, mainly metal products (ISIC 381). However, only 8.4 per cent of these inputs originate from domestic sources. The proportion of imported raw materials and components is very high, particularly in regard to input into the production of storage batteries (96.1 per cent); radio, TV-sets and communication equipment (89.7 per cent); as well as electrical apparatus and supplies (87.9 per cent) (Table II.9). Domestic inputs originate mainly from non-metallic mineral products (ISIC 36) (89 per cent) primarily glass bulbs and tubes for lamps.

Investments through branches of foreign banks seem to play a leading role in the provision of finance. Government banks do not provide any significant credit to enterprises of the sector. Domestic machinery products are highly protected against competing imports through high rates of effective protection estimated at 111 per cent (Annex Table 19).

Fabricated metal products (ISIC 381)

A highly heterogeneous group which consists of: agricultural hand tools and equipment: cutlery, screws, and bolts; kitchen apparatus; metal furniture and fixtures; structural metal products; metal containers; and other metal products. The main products are: galvanized corrugated and flat sheets (for roofing purposes); pipes; construction works; and aluminum extruded products. Other products include machine parts, hand tools, and gas lamps, bars, wire rod, wires, nuts, pipes, and sheets.

In 1981 there were some 355 enterprises employing around 44,000 persons or 4.2 per cent of total manufacturing employment. The corresponding share of value added was 3.5 per cent. Manufacturing value added and employment grew during 1970-80 at an average annual rate of 20.2 per cent and 11.5 per cent respectively, implying a yearly growth rate of labour productivity of 8.7 per cent. The average labour productivity, however, is still very low for all sub-groups of this branch.

The average plant size, 124 persons per enterprise in 1981 has been increasing since 1975. The small scale and cottage industries play an important role in employment and output of metal products, as indicated in Table II.5. The number of persons engaged in small and cottage industries in fabricated metal products in 1979 was 26,445 persons and 27,039 persons respectively which compares with 35,507 persons engaged in medium and large industry.

Most medium and large enterprises are located in Jakarta (125 enterprises) and East Java (93 enterprises), followed by West Java (45), Central Java (33), North Sumatra and Riau (34), Yogyakarta (8) and Sulawesi (8 enterprises).

Almost all fabricated metal products are sold domestically. There are virtually no exports. Backward linkages to the domestic iron and steel industry have not been fully developed. Most inputs, mainly intermediate goods from the basic steel industry, are still imported, except in the case of production of cutlery, screws and bolts as well as metal furniture and fixtures where domestic raw materials predominate (Table II.9). However as far as inputs from the chemical sector (mainly paint) is concerned, almost 50 per cent is from domestic origin.

Production processes in the metal products industry are quite diverse. Some factories use traditional and outdated technology and product quality is often questionable. But there are also some modern plants using new and sophisticated technology. The fabricated metal products branch exhibits a low average level of capital invested per plant, and a low capital intensity.

Non-pribumi ownership is the largest category (38.5 per cent), followed by pribumi enterprises (26.9 per cent); foreign enterprises (23.0 per cent), while Government enterprises are few in numbers (11.6 per cent). A majority have legal status of PT (perusahaan terbatas = limited company). Government banks play an important role in providing capital for this sector and thus have a major influence on decisions concerning this sector. The rates of capital utilization vary widely from 10-20 per cent to 60-70 per cent due to the heterogeneous character of the branch. Fabricated metal products enjoy a relatively high degree of protection against competing imports through high rates of effective protection estimated at 56.6 per cent (Annex Table 19).

Chapter IV. Planned Developments - REPELITA III and IV

Major planned investment prospects

Planning for REPELITA IV (1 April 1984 - 31 March 1989) assumes an economic growth (GDP) of 5 per cent per annum. The industrial sector is expected to grow at a rate of 9.5 per cent a year while growth of agriculture is put at 3 per cent per annum. The industrial sector will assume a more prominent place in Indonesia's economic structure.

The engineering industry will command high priority during REPELITA IV. The planned growth rate for this industry is expected to be substantially higher than the 9.5 per cent growth rate envisaged for the overall manufacturing sector. Special attention will be directed towards the development of industries that produce industrial machinery, with the intention that Indonesia will gradually be able to meet her own needs for machinery - including spare parts - in further development of industry.

Industrial development will also be intensified to ensure supplies of raw materials. Industrial growth will be stepped up to produce equipment for agriculture, agricultural implements and agricultural processing machinery. REPELITA IV is thus expected to strengthen the important nexus between industry and agriculture. It is in this context that the present study assumes crucial importance by identifying opportunities for domestic production of capital goods required for processing specific agricultural and forestry resources.

During REPELITA III and REPELITA IV a number of key projects (52) were planned for the basic metals sector, the basic chemical industry sector and the sub-sector multifarious industry. The total investment requirements for these 52 key projects were estimated at US $11,791.28 million. A complete list of these key projects is contained in Annex Table 20.

Among the 52 key projects, 18 projects were planned for the basic metals industry sector with total investment requirements estimated at US $2,226 million. Some of these investment projects were initiated during REPELITA III and will go into operation during the last year of REPELITA III and/or the first years of REPELITA IV, while others are under negotition or still open for negotiation. In early 1983 the Government decided to review the whole public investment progrmme following the general economic slowdown and the deteriorating balance of payments situation. As a result a number of projects were either postponed, rescheduled, "deferred", or reconsidered.

The original 1982 investment schedule for the basic metals industry which will no doubt be further reconsidered, includes the following 18 investment projects,[1/] some of which have been implemented while others are being negotiated or rescheduled (See also Annex Table 20):

"1. The establishment of a Pellet Factory in Cilegon, West Java, with an investment of approximately US$ 130 million and a production capacity of 3,000,000 tons/year. This project was to commence in 1982 and should be completed in 1984.

2. The establishment of a Slab Factory and a Hot Strip Mill in Cilegon, West Java. The establishment of this project has been realized.

3. The establishment of a Cold Sheet Mill Factory in Cilegon, West Java, with an investment of approximately US $490 million, to produce 500,000 tons/year of cold rolled sheet. This project is being carried out.

4. The establishment of a Tin Plate Factory in Cilegon, West Java, with an investment of approximately US $56.90 million to produce 60,000 up to 100,000 tons/year of tin plate. This project is to start in 1983 and will be completed in 1985.

5. The establishment of a Seamless Pipe Factory, free location with planned investment of approximately US $186.05 million to produce 150,000 tons/year of seamless pipes. This project is to commence in 1983 and should be completed in 1985.

6. The establishment of a Diesel and Petrol Engine Factory in the regions of Java with planned investment of approximately US $448 million, to produce 200,000 units/year of diesel/petrol engines. This project is to be completed in 1984.

1/ Development Program for Basic and Key Industries and Some Ideas on Industrial Development in the Fourth Repelita, Jakarta, April 1982, Ministry of Industry.

7. The establishment of Ship Yards in Jakarta, Surabaya (Java), Ujung Pandang (South Sulawesi) and Palembang (South Sumatra) with an investment of approximately US$ 49.60 million to produce/construct new ships: 21,000 BRT and to conduct repair works: 540,000 BRT. This project has commenced in 1981 and should be completed in 1984.

8. The establishment of a Casting Products (Blanks) Factory for Machines in Cilegon, West Java, with an investment of approximately US $90.57 million an the capacity to produce:
   - Gray Iron Castings : 44,000 tons/year
   - Aluminium Alloy Castings : 4,200 tons/year

   This project is to be completed in 1984.

9. The establishment of a Forging Products (Blanks) Factory for Machines in Cilegon, West Java, with an investment of approximately US $74.89 million, and the capacity to produce:
   - Parts, chassis and transmision : 31,000 tons/year

   This project is to be completed in 1984.

10. The establishment of a Machine Tools Factory in Cilegon, West Java, with an investment of approximately US $4 million, and the capacity to produce:
    - lathes : 650 units/year

    This project is to be completed in 1984.

11. The establishment of a Heavy Equipment Factory in the regions of Java with an investment of approximately US $147.22 million and the capacity to produce:
    - Wheel Loaders : 2,980 units/year
    - Crawler Tractors : 700 units/year
    - Exacavators : 100 units/year

    This project is being carried out.

12. The establishment of a Railway Carriage Factory in Madiun, East Java, with an investment of approximately US $96 million, and the capacity to produce:
    - Cargo Carriages : 200 carriages/year
    - Passenger Carriages : 42 carriages/year

    This project has commenced in 1981 and should be completed in 1984.

13. The establishment of a Power Train Factory, Suspension and Steering System for Motor Vehicles in Jakarta or Surabaya, East Java, with an investment of approximately US $38.40 million, and a production capacity of 150,000 units/year. This project was to commence in 1982 and is to be completed in 1985.

14. The establishment of an Engine Factory for Motorcycles in Jakarta or Surabaya, East Java, with an investment of approximately US $16.80 million, and a production capacity of 200,000 units/year. This project was to commence in 1982 and is to be completed in 1985.

15. The establishment of a General Machinery Shop for Manufacturing in Surabaya, East Java, with an investment of approximately US $235 million and capacity to produce:
    - for Sugar Mills : 6,500 tons/year
    - for Palm Oil Factories : 8,000 tons/year
    - for Crumb Rubber Factories : 450,000 tons/year

    This project commenced in 1982 and is to be completed in 1985.

16. The establishment of a Copper Cathode Factory outside Java with an investment of approximately US $130 million and a production capcity of 40,000 tons/year. This project is to be completed in 1985.

17. The establishment of a Factory making Heavy Electrical Machinery and Equipment with an investment of approximately US$ 28 million. The location of this factory is recommended in one of following three locations: Jakarta, Bandung or Surabaya. This project is planned to commence in 1983 and will be completed in 1985.

18. The establishment of a Dies and Mould Factory with an investment of approximately US $5 million. Location of the factory has not been decided. The project was to commence in 1983 and is to be completed in 1985."

Demand and supply balances (capacity, production and domestic demand)

Capital investment realised during REPELITA I and II through the first and second year of REPELITA III mostly went into production of consumer goods for the domestic market through import substitution. During the third, fourth and fifith year of REPELITA III a series of important projects were launched *inter alia* in the field of basic metals industry.

The investment realised in development projects of the basic metals industry from the first through the fourth years (1979/80-1982/83) of the REPELITA III period. Totalled Rp. 2,263.4 thousand million and US $1,369.7 million. This investment consisted of Rp. 150.2 thousand million non-domestic foreign investment schemes; Rp. 2,113.2 thousand million domestic investment schemes and US $1,369.7 million foreign investment schemes. The investment realised in these projects would result in a significant increase in the sectoral capacity and production.

The Government has formulated programmes for development of national capacity for certain key industrial products. Estimates of demand and supply in terms of capacity, production and domestic demand have been elaborated for a number of important industrial products at the five digit ISIC level for the period 1982/83 - 1986/87. The estimated supply and demand position for engineering products (ISIC 38) are indicated in Annex Table 21. These estimates are based on the above mentioned investments implemented in the basic metals industry during the first four years of REPELITA III.

The programme for development and utilization of national capacity in selected basic metals industries including capital goods and engineering industries is briefly outlined in the following (see also Annex Table 21):[1/]

Iron and steel industry

The capacity for steel bar plant in 1982/83 was 2 million tons, while the production of steel bars was 391,000 tons, implying a capacity utilization rate of only about 20 per cent. The consumption of steel bars during the same period was 350,500 tons, the excess quantity of 40,500 tons was designated for the export market. The capacity for concrete iron bars production in 1982/83 was 1,200,000 tons, while the production was 745,000 tons, or about 62 per cent of the capacity. The demand for concrete iron bars during the same period was 695,800 tons. The excess production of 49,200 tons was destined for exports.

Non-iron/steel metal industry

The aluminium ingot industry of Asahan had commenced production at the end of 1982 with 115,000 tons output, while the capacity per annum was 225,000 tons. The demand for aluminium ingots during the same period was 24,000 tons. The excess production was 91,000 tons.

1/ The Development of National Capacity in Industry for 1983-1986 - Summary, Ministry of Industry, Republic of Indonesia, 1983 (unofficial translation)

Additionally, copper rod had also been produced at a capacity of 50,000 tons, while the production in 1982 was 24,000 tons using imported raw material.

Mechanical utensils industry

The mechanical utensils industry in Indonesia began to develop, with activities in machinery reconditioning, and production of certain types of mechanical utensils on a job-order basis. The Government is constructing a lathe plant (in Cilegon) with a capacity of 300 units per annum which will be completed in 1983. Mechanical utensils to an amount of 10,126 units valued US $35.3 million were imported in 1981.

The demand in 1989 is estimated (in units) at 5,950 lathes, 6,250 drillers, 9,600 sawing machines, and 1,000 milling machines.

Factory machinery and utensils industry

The factory machinery and utensils industry has reached a capacity of 60,000 tons per annum. It is capable of producing machinery for palm oil mills, sugar mills, and - to a certain extent - also for cement factories, fertilizer plant, steel industry, petroleum refinery and mining.

Commodities that have been produced locally include, among others, steel construction of various sizes, boilers with a capacity of 20 tons of steam per hour, farm tanks, pumps, silos, etc. The demand in 1989 is estimated to reach 409,000 tons.

Heavy duty and construction equipment industry

A heavy duty equipment industry has developed in Indonesia since the period of Repelita I, producing road rollers (1,140 units per annum capacity), stone crusher (565 units per annum), concete mixers (2,000 units per annum), and asphalt mixing plants (eight units per annum). The demand for heavy duty equipment is growing at an average rate of 10 per cent per annum and, in 1989, is estimated to reach 726 road rollers, 3,000 bulldozer and 360 wheel loaders.

To meet the above-mentioned demand, construction of new plants has commenced under the Foreign Investment Scheme (FIA) with a capacity of 2,290 units per annum as follows:

- bulldozer : 1,240 units/annum
- excavator : 450 units/annum
- wheel loader : 335 units/annum
- motor grader : 265 units/annum

There are at present six plants for the production of non-stationary diesel motors, with a capacity of 88,664 units per annum. The annual capacity for each type of diesel motor is as follows:

above 20 HP : 19,264 unit /annum
below 20 HP : 69,400 units/annum

Demand in 1983/84 is expect to reach 192,000 units.

Agricultural equipment industry

Agricultural machinery/equipment has been produced locally in considerable quantity, including tractors, water pumps, threshers, polishers, hullers, rice milling units and sprayers.

The demand for agricultural machinery/equipment is steadily increasing. In 1989 demand for tractors expected to reach 27,000 units, threshers 2,540 units, polishers 83,750 units, hullers 84,881 units and rice milling 30,000 units.

Basically, capacity has been sufficient to meet the domestic demand, such as 10,000 tractors, 2,500 threshers, 6,100 hullers and rice milling 1,570 units per annum.

Electric equipment industry

The main products of the electric equipment industry in the near future are generators and electric motors. The generator in demand is one of small capacity (2 to 10 KVA) for household purposes, and also of a capacity above 10 KVA for industrial purposes as well as for the development of national electric supply network (for rural areas). The electric motor demanded is particularly one for industry/factory equipment, the demand for which now reaches 220,000 units per annum as against a present national capacity of only about 17,000 units per annum.

Electronic equipment industry

The products of the professional electronic industry which is expected to develop in the near future are for telecommunications, electronic data processing, and electronic active component. Of the above-mentioned three commodities, only telecommunications equipment has entered into production, leaving the other two behind.

Commercial vehicles industry

The supply of four-wheel vehicles is currently in the hands of 22 Sole Agents/Authorized Dealers covering 20 Assembling Plants which actively produce 31 makes of vehicle consisting of 78 types. The capacity of domestic production of four-wheel vehicles is currently 350,000 units per annum consisting of commercial as well as passenger vehicles.

The motor vehicle industry, which in recent years has attracted attention for its performance, has been developed to meet domestic demand, and to encourage the growth of supplier industries.

The procedure governing the use of spare parts for commercial four-wheel motor vehicles is reflected in the Decree issued by the Minister of Industry No. 168 year 1979 which required the use of only locally made spare parts, including engines, not later than the end of 1988. A statement has also been issued authorizing seven assembling establishments to produce motor vehicle engines with a total capacity of 460,000 units per annum.

Railway rolling stock industry

PT INKA is so far the only industrial establishment in the railway rolling stock industry. It is located in Madium and has been capable of producing railway carriages. The plant commenced production in 1981, assembling imported CKD raw material. The output of this plant mainly goes into the domestic market. Production capacity at present reaches 300 cargo carriages per annum.

By the middle of the Repelita IV, production capacity is to be increased to 600 cargo carriages and 50 passenger carriages per annum.

Electrically Operated Train (KRL) and Diesel Operated Train (KRD) are to be produced early in Repelita V, each with production capacity of 20 units per annum.

Ship building industry

The objective of ship building industry development is to increase the capacity of the industry so as to meet the whole demand of the national sea going fleet, both for the new boat construction and for repair.

There are at present 82 shipyards for steel boats, 68 for wooden vessels and 1,500 for traditional vessels located in many different places of the country, but with 75 per cent on Java. The capacity is 1,150,000 DWT per annum for repair and 195,000 DWT for new construction.

Aircraft industry

The only industrial establishment in aircraft production is PT Nurtanto Aircraft Industry which is capable of producing various types of aircraft.

The output of this plant is intended not only to meet domestic demand, but also for export to Burma, Pakistan, etc.

The production capacity for the fixed wing aircraft, is 24 units per annum for C-212 type, and 11 units per annum for CN-235 type . Production capacity for rotary wing helicopter, is 36 units per annum for BO-135 type, and 12 units per annum for PUMA type.

Location

The basic metal industry is mainly located on Java and in northern Sumatra, including the aluminum industrial centre in Asahan. The basic metal and metal fabricating industry is concentrated in the Cilegon area (West Java) and to a less extent Jakarta, East Java and North Sumatra.

The factory machinery industry is found in East Java, Jakarta, West Java, Central Java and North Sumatra. Machinery workshops of the basic chemical industrial estates will also be developed into engineering plants.

Electric and professional electronic equipment industries are found in West Java and Jakarta. While ship building is scattered throughout almost all areas of Indonesia, the motor vehicle industry is concentrated on Jakarta area.

Raw materials

Manufacturers producing raw materials for steel and iron casting industries, as well as for steel making have to date been encouraged through increase of iron bar production by PT Krakatau Steel. The motor, engineering and factory machinery industries still depend on importation of raw materials. But to promote use of domestic products in these industries, a subcontracting system has been introduced and is being encouraged. Several items of locally produced raw materials for the electric industry such as enamel, copper wire, etc. have been developed, while the rest is still to be imported. The transport vehicle industry still has to procure raw materials through importation on the basis of subcontracting system.

Chapter V. Summary of Main Features and Constraints

The salient features of the structure and performance of capital goods and engineering industries may be summarized as follows:

i) The base of the entire capital goods and engineering industry is very narrow both in regard to the number of establishments and the range of products they produce.

ii) An embryonic capital goods industry has emerged in recent years which is estimated to account for around 28.2 per cent of the engineering goods sector, the equivalent of around 5 per cent of the entire manufacturing sector in terms of output.

iii) The number of plant equipment and machinery industry products produced remain small but is increasing; they are mainly used for processing agricultural crops.

iv) The capital goods and engineering industry sectors rank among the fastest growing industries within the entire Indonesian manufacturing sector both in regard to employment, and value added. The high growth rates are in part attributable to the low initial base.

v) Assembly operations using imported parts and components predominate, especially in the electrical machinery and transport equipment industries. While actual production and fabrication of complete industrial products, is limited and confined to a narrow range of products, there is some production of components and parts.

vi) Assembly operations in the transport equipment industry (cars, motorcycles, bicycles) and electrical machinery (radios, TV sets, and various consumer durables) account for a very large part of growth in the engineering industry. These manufacturing activities usually involve unskilled or semi-skilled labour.

vii) There is some indication that the engineering and capital goods industry has become more capital intensive and/or generated more profit since 1975 as reflected in the declining share of wages and salaries in value added, which in 1980 amounted to 20 per cent.

viii) Production of non-electrical machinery, which includes most capital goods, has lagged behind i.e. its share of employment and value added has declined within the engineering industry. Production of capital goods in this branch involves higher skills, which are in very short supply and their shortage is one of the main impediments for the further development of this sector. Other constraints are rooted in the low of investment levels and the predominant use of outdated technology and old equipment as well as inadequate management and marketing skills.

ix) Most capital goods and engineering industries supply the domestic market, the only exception being electronic equipment where some foreign firms export part of their production.

x) The incidence of import dependence for raw materials is very high; around three-quarters of total material requirements are imported. Backward linkages to the domestic iron and steel industry and linkages within the engineering industry itself have not yet been fully developed.

xi) Most engineering industries, except non-electronic machinery, enjoy high levels of protection against competing imports through high rates of effective protection.

xii) Most engineering enterprises belong to the medium and large scale category. The average plant size has been increasing from 104 persons in 1975 to 163 per sons in 1981. However, small enterprises are important in fabricated metal products. Many small enterprises provide a breeding ground for entrepreneurial and skill development and could be expanded and be upgraded to medium scale level through sub-contracting and other arrangements with medium and large enterprises.

xiii) Almost one-third of all engineering enterprises are located in Jakarta, and close to one-fourth in East Java. Nearly to one-fifth are located in West Java. Outside Java there were a few enterprises in Sumatra but in the other regions the incidence of any organised engineering industry is very restricted.

xiv) Considerable investments were channelled into the transport equipment, metal products and electrical machinery industries while investments in the non-electrical machinery and professional scientific equipment industries were sluggish. This partly explains the lagging performance of the latter two branches.

xv) Public enterprises are particularly important in the transport equipment and non-electrical machinery industy, where they account for around one-fourth of all enterprises. Many of these enterprises are very old and in need of rehabilitation and upgrading of their management system and technological base. Their institutional linkages to Government supervisory and control agencies need to be made more business oriented. A complete management review of their operations and decision making procedures would appear to be prerequisite for performance improvement.

xvi) The engineering and capital goods industry will command high priority during REPELITA IV. The planned growth rate for this industry is expected to be substantially higher than the 9.5 per cent growth rate envisaged for the overall manufacturing sector.

xvii) During REPELITA III and REPELITA IV 18 key projects were planned in the basic metals industry sector with total investment requirements estimated at US $2,226 million. Some of these have been implemented while others are under negotiation or open for investment.

xviii) The realised and planned investment in the engineering and capital goods industry during REPELITA III and REPELITA IV would result in a significant increase in national capacity. In this context the Government has formulated programmes for the development of national capacity for certain key industrial products and estimates of supply and demand have been elaborated covering the period 1982/83-1986/87.

STATISTICAL ANNEX

Annex

EXPLANATORY NOTE

Definition of ISIC 371 and ISIC 38

ISIC	
37100	Iron and Steel Basic Industry
38111	Agriculture, hand tools
38112	Cutlery, screws, bolts
38113	Kitchen apparatus
38120	Metal furniture and fixture
38130	Structural metal products
38140	Metal containers
38190	Metal products n.e.c.
38200	Machinery and repair
38311	Storage batteries
38312	Dry cell batteries
38320	Radio, TV, comm. equip.
38330	Elec. apparatus/supplies
38340	Repair of elec. appl.
38411	Ship building and repair
38430	Motor vehicles ass./manu.
38440	Motor cycle/3 wheel veh.
38450	Bicycle, becak ass./manu.
38460	Motor vehicle body + equip.
38490	Transport equip. n.e.c.
38500	Manu. of scientific equip.
38	Metal products, machinery and equipment

Annex Table 1

<u>Gross output, value added, share of wages and salaries in value added,</u>
<u>1975, 1980 and 1981</u>
(values in Rp. thousand million, current prices)

ISIC		Gross Output						Value Added						% Share of Wages and Salaries in Value Added		
		1975		1980		1981		1975		1980		1981				
		Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	1975	1980	1981
371	Iron and Steel Industries	5.0	-	237.7	-	249.4	-	1.1	-	70.0	-	79.5	-	32	13	12
381	Metal Products	65.8	37.2	285.3	24.6	338.7	22.6	16.9	26.5	74.2	20.7	85.4	16.1	32	29	33
382	Non-electrical Machinery	20.1	11.4	81.3	7.0	110.4	7.4	8.0	12.6	33.4	9.3	42.9	8.1	24	24	24
383	Electrical Machinery	53.5	30.2	387.1	33.5	442.9	29.6	18.3	28.7	112.6	31.5	125.9	23.6	20	22	23
384	Transport Equipment	37.1	21.0	402.8	34.7	604.8	40.3	20.3	31.9	136.2	38.1	277.8	52.1	36	20	14
385	Scientific, Photographic Equipment	0.5	0.2	2.8	0.2	2.1	0.1	0.2	0.3	1.4	0.4	0.7	0.1	40	26	56
	Total ISIC 38	177.0	100.0	1,159.3	100.0	1,498.9	100.0	63.7	100.0	357.8	100.0	533.0	100.0	29.2	22.8	20.0

Source: Survey of Manufacturing Industries, BPS, Indonesia, 1975, 1980 and 1981.

Annex Table 2

Value added per person engaged in million Rp. and index 1975, 1980 and 1981

		Value Added Per Person Engaged (million Rp.)			Value Added Per Person Engaged (Index=Total ISIC 38= 100)		
		1975	1980	1981	1975	1980	1981
371	Iron and Steel Industries	0.4	7.6	8.4	38.9	257.9	208.2
381	Metal Products	0.8	1.8	1.9	77.2	61.3	48.3
382	Non-electrical Machinery	0.9	2.8	3.4	93.1	94.1	84.1
383	Electrical Machinery	1.7	3.0	3.2	144.1	102.2	80.7
384	Transport Equipment	1.0	4.5	7.7	107.3	154.2	192.0
385	Scientific, Photographic Equipment	0.4	1.5	0.7	39.7	49.4	17.6
	Total ISIC 38	1.0	2.9	4.0	100.0	100.0	100.0

Source: Statistical Yearbooks of Indonesia (various issued).

Annex Table 3

Average annual rate of growth of value added, employment and labour productivity 1975-80 and 1980-81

ISIC		Value Added[a]		Employment		Labour Productivity	
		1975-80	1980-81	1975-80	1980-81	1975-80	1980-81
		Percentage		Percentage		Percentage	
371	Iron and Steel Industries	93.9	12.2	25.1	7.5	68.8	4.7
381	Metal Products	13.5	13.7	12.8	7.3	0.7	6.4
382	Non-electrical Machinery	12.5	26.9	6.4	5.0	6.1	21.9
383	Electrical Machinery	21.5	10.5	29.0	3.7	7.5	6.8
384	Transport Equipment	23.6	101.5	9.2	19.9	14.4	81.6
385	Scientific, Photographic Equip.	24.7	-50.6	16.7	3.3	8.0	-47.3
Total ISIC 38		19.3	47.2	14.6	9.0	4.7	38.2

Source: Survey of Manufacturing Industries, BPS, Indonesia, 1975, 1980 and 1981.
Statistical Yearbooks of Indonesia.

a/ Real growth rates, using the general manufacturing price index.

Annex Table 4

Number and Size of Establishments in ISIC 371 Iron and Steel Basic Industries and ISIC 38 Metal Products, Machinery and Equipment 1975, 1980 and 1981.

	Number of Establishments			Average Plant Size (Persons Engaged Per Establishment)		
ISIC	1975	1980	1981	1975	1980	1981
37100	13	23	22	222	384	431
38111	14	22	22	57	81	68
38112	34	41	39	75	100	110
38113	45	53	51	112	112	126
38120	25	46	46	50	56	72
38130	65	93	95	116	142	149
38140	42	62	60	70	107	130
38190	57	46	42	41	149	156
38200	98	132	128	90	91	99
38311	10	12	13	54	86	88
38312	14	11	9	264	539	692
38320	18	34	36	268	427	448
38330	33	53	55	41	296	274
38340	2	3	2	25	65	83
38411	30	42	46	245	167	158
38430	25	32	38	349	357	375
38440	8	15	14	-	371	491
38450	26	35	33	48	46	54
38460	29	50	55	69	86	104
38490	-	4	2	-	17	17
38500	15	25	27	31	40	38
38	590	811	813	104	150	163

Source: Survey of Industries, BPS, Indonesia Vol. I, 1975, 1980 and 1981.

Annex Table 5

Employment in ISIC 371 Iron and Steel Basic Industries and ISIC 38, Metal Products, Machinery and Equipment 1975, 1980 and 1981.

ISIC	Persons Engaged 1975 No.	1975 %	1980 No.	1980 %	1981 No.	1981 %	1975-80 Average Annual Rate of Growth	1980-81 Average Annual Rate of Growth
37100	2,883	-	8,822	-	9,463	-	25.1	7.5
38111	803	1.3	1,782	1.5	1,492	1.1	17.3	-16.3
38112	2,537	4.1	4,096	3.4	4,285	3.2	10.0	4.6
38113	5,040	8.2	5,915	4.9	6,434	4.9	3.2	8.8
38120	1,255	2.0	2,566	2.1	3,321	2.5	4.5	29.4
38130	7,510	12.2	13,240	10.9	14,129	10.7	12.0	6.7
38140	2,928	4.8	6,605	5.4	7,825	5.9	17.7	18.5
38190	2,361	3.8	6,851	5.6	6,551	4.9	23.7	-4.4
38200	8,833	14.4	12,055	9.9	12,658	9.6	6.4	5.0
38311	545	0.9	1,029	0.8	1,147	0.9	13.6	11.5
38312	3,689	6.0	5,932	4.9	6,229	4.7	10.0	5.0
38320	4,815	7.8	14,527	12.0	16,142	12.2	24.7	11.1
38330	1,364	2.2	15,706	12.9	15,095	11.3	63.0	-3.9
38340	50	0.1	194	0.2	165	0.1	31.2	-14.9
38411	7,357	12.0	7,034	5.8	7,261	5.5	-0.9	3.2
38430	8,727	14.2	11,424	9.4	14,250	10.8	5.5	24.7
38440	-		5,568	4.6	6,869	5.2	-	23.4
38450	1,260	2.0	1,614	1.3	1,795	1.4	5.1	11.2
38460	2,012	3.3	4,284	3.5	5,740	4.3	16.3	34.0
38490	-		67	0.1	34	-	-	-49.2
38500	460	0.8	990	0.8	1,023	0.8	16.6	3.3
38	61,546	100.0	121,479	100.0	132,445	100.0	14.6	9.0

Source: Survey of Industries, BPS, Indonesia Vol. I, 1975, 1980, 1981.

Annex Table 6

Value Added in ISIC 371 Iron and Steel Basic Industry and ISIC 38 Metal Products, Machinery and Equipment 1975, 1980 and 1981.

ISIC	1975 Mill. Rp.	%	1980 Mill. Rp.	%	1981 Mill. Rp.	%
371	1,097.0	-	66,996.9	-	79,487.9	-
38111	145.7	0.2	1,660.3	0.5	1,178.9	0.2
38112	1,127.3	1.8	6,453.6	1.8	9,660.8	1.8
38113	1,087.7	1.7	2,672.0	0.8	3,919.0	0.7
38120	639.3	0.7	1,882.7	0.5	3,528.6	0.7
38130	11,410.0	17.9	44,898.9	12.6	47,080.3	8.8
38140	1,878.2	3.0	11,902.7	3.3	15,557.9	2.9
38190	800.3	1.3	4,681.3	1.3	4,776.3	0.9
38200	8,034.4	12.6	33,418.0	9.3	42,858.2	8.1
38311	860.9	1.4	3,608.6	1.0	5,939.0	1.1
38312	2,721.5	4.3	10,682.3	3.0	12,134.8	2.3
38320	10,476.7	16.4	39,330.0	11.0	46,061.5	8.7
38330	4,200.1	6.6	58,776.0	16.4	61,398.2	11.5
38340	17.3	0.1	171.2	0.1	409.2	0.1
38411	6,199.3	9.7	20,197.6	5.6	26,864.8	5.0
38430	12,204.3	19.2	77,386.8	21.6	101,277.6	19.0
38440	55.2	0.1	30,595.4	8.6	137,426.7	25.8
38450	977.5	1.5	1,068.5	0.3	1,274.3	0.2
38460	893.2	1.4	6,853.3	1.9	10,993.6	2.1
38490	-	-	46.0	0.1	35.7	-
38500	177.6	0.3	1,440.9	0.4	724.3	0.1
38	63,701.9	100.0	357,726.1	100.0	533,099.7	100.0

Source: Survey of Industries, BPS, Indonesia, Vol. I, 1975, 1980, 1981.

Annex Table 7

Gross Output for ISIC 371 Iron and Steel Basic Industry and ISIC 38 Metal Products, Machinery and Equipment 1975, 1980 and 1981

Gross Output
Mill. Rp.

ISIC	1975	1980	1981
371	5,027.3	237,707.1	249.405.9
38111	257.7	2,825.2	2,578.1
38112	7,692.3	42,355.5	47,272.5
38113	4,041.0	9,679.9	12,878.9
38120	1,245.5	5,446.7	9,416.4
38130	44,493.3	180,979.9	209,553.6
38140	5,839.1	30,631.2	42,889.0
38190	2,223.0	13,401.2	14,117.6
38200	20,137.7	81,291.0	110,433.5
38311	1,905.0	9,707.0	13,451.4
38312	11,900.0	39,204.9	43,215.4
38320	27,862.8	191,951.3	230,177.7
38330	11,805.4	145,727.7	155,466.2
38340	20.5	553.5	621.5
38411	12,691.6	34,767.5	43,547.4
38430	20,476.0	196,627.5	242,479.5
38440	304.0	147,037.0	284,674.7
38450	1,843.4	3,574.4	4,016.3
38460	2,076.2	20,692.0	29,923.0
38490	-	75.1	110.8
38500	461.9	2,816.1	2,016.9
38	177,276.4	1,159,344.6	1,498,885.4

Source: Survey of Industries, BPS, Indonesia Vol.I, 1975, 1980 and 1981.

Annex Table 8

Ratio of Value Added to Gross Output, 1975, 1980 and 1981

ISIC	1975	1980	1981
371	21.8	28.2	31.8
38111	56.6	58.8	45.7
38112	14.7	15.2	20.4
38113	26.9	27.6	30.4
38120	35.2	34.6	37.5
38130	25.6	24.8	22.5
38140	32.2	38.8	36.3
38190	36.0	34.9	33.8
38200	40.0	41.1	38.8
38311	45.2	37.2	44.2
38312	22.9	27.2	28.1
38320	37.6	20.5	20.0
38330	35.6	40.3	39.5
38340	84.3	30.9	65.8
38411	48.8	58.1	61.7
38430	59.6	39.4	41.8
38440	-	20.8	48.3
38450	53.0	29.9	31.7
38460	43.0	33.2	36.7
38490	-	61.2	32.2
38500	38.4	51.2	35.1
38	35.9	30.9	35.6

Source: Survey of Industries, BPS, Indonesia, 1975, 1980 and 1981.

Annex Table 9

Wages and Salaries and Labour Intensity ISIC 371 Iron and Steel Industry and ISIC 38 Metal Products, Machinery and Equipment 1975, 1980 and 1981

(values in million Rp.)

ISIC	Total Employment Costs (Wages and Salaries) (million Rp.)			Share of Wages and Salaries in Value Added		
	1975	1980	1981	1975	1980	1981
371	356	8,932.0	9,190.5	32.4	13.3	11.6
38111	63.7	515.6	649.1	43.8	31.0	55.1
38112	431.0	1,925.7	2,424.6	38.2	29.8	25.1
38113	581.5	1,572.7	2,367.6	53.5	58.9	60.4
38120	178.9	765.1	1,376.8	40.8	40.6	39.0
38130	2,774.9	10,059.8	12,151.1	24.3	22.4	25.8
38140	1,154.4	4,541.0	7,120.4	61.4	38.2	45.8
38190	257.2	1,917.6	1,993.0	32.1	41.0	41.7
38200	1,899.4	8,101.4	10,172.6	23.6	24.2	23.7
38311	176.8	651.1	947.5	20.5	18.0	16.0
38312	828.6	4,527.5	5,934.3	30.4	42.4	48.9
38320	1,456.5	9,062.1	10,765.4	13.9	23.0	23.4
38330	400.4	9,998.0	11,563.2	9.5	17.0	18.8
38340	10.1	79.3	92.0	58.4	46.3	22.5
38411	3,169.9	5,917.8	7,206.2	51.1	29.3	26.8
38430	3,344.0	13,446.7	17,723.5	27.4	17.4	17.5
38440	-	5,097.8	8,479.5	-	16.7	6.2
38450	264.1	636.4	601.2	27.0	59.6	47.2
38460	511.7	2,352.6	4,403.3	57.3	34.3	40.1
38490	-	23.8	21.3	-	51.9	59.6
38500	69.8	368.1	405.4	39.3	25.5	56.0
38	17,572.9	81,560.1	106,398.0	27.6	22.8	20.0

Source: Survey of Industries, BPS, Indonesia, 1975, 1980 and 1981.

Annex Table 10

Labour Productivity in ISIC 371 Iron and Steel Basic Industry and ISIC 38 Metal Products, Machinery and Equipment, 1975, 1980 and 1981

	Value Added per Person Engaged ('000 Rp.)			Value Added per Person Engaged (Index total ISIC 38=100)		
	1975	1980	1981	1975	1980	1981
371	380	7,594	8,382	-	-	-
38111	181	932	790	18	32	20
38112	444	1,598	2,254	43	54	56
38113	216	452	609	21	15	15
38120	350	734	1,063	34	25	26
38130	1,519	3,391	3,332	147	115	83
38140	641	1,802	1,988	62	61	49
38190	339	683	729	33	23	18
38200	910	2,772	3,386	88	94	84
38311	1,580	3,507	5,178	153	119	129
38312	738	1,801	1,948	71	61	48
38320	2,176	2,707	2,854	210	92	71
38330	3,079	3,742	4,067	298	127	101
38340	345	882	2,480	33	30	62
38411	843	2,871	3,700	81	98	92
38430	1,398	6,774	7,107	135	230	177
38440	-	5,495	20,006	-	187	497
38450	776	662	710	75	23	18
38460	444	1,600	1,915	43	54	48
38490	-	686	1,050	-	23	26
38500	386	1,455	708	37	49	18
38	1,035	2,945	4,025	100	100	100

Source: Survey of Industries, BPS, Indonesia, Vol. , 1975, 1980 and 1981.

Annex Table 11

Employment Cost: Total and Per Person Engaged, 1981

ISIC	Total Employment Cost Annually (million Rp.)	Employment Cost Per Person Engaged (000 Rp.)	
		Annually (000)	Per Month
371			
38111	649	435	36.2
38112	2,425	566	47.2
38113	2,368	368	30.7
38120	1,377	415	34.6
38130	12,151	860	71.7
38140	7,120	910	75.8
38190	1,993	304	25.3
38200	10,173	804	67.0
38311	947	826	68.8
38312	5,934	953	79.4
38320	10,765	667	55.6
38330	11,563	766	63.8
38340	92	558	46.5
38411	7,206	992	82.7
38430	17,724	1,244	103.6
38440	8,479	1,234	102.9
38450	601	335	27.9
38460	4,403	767	63.9
38490	21	625	52.1
38500	405	396	33.0
38	106,397	803	66.9

Source: Survey of Manufacturing Industries, BPS, Indonesia, 1981.

Annex Table 12

Geographical distribution of ISIC 371, iron and steel basic industries, 1981

Area	Number of Establishments No.	Persons Engaged No.	Persons Engaged %	Avg. Plant Size Persons Engaged per Enterprise	Gross Output	Value Added
1. Jakarta	10	2,688	28.3	269		
2. Java	8	6,241	65.8	780		
-Yogyakarta	0	0	0	-		
-East Java	4	1,699	17.9	425		
-West Java	1	4,141	43.7	4,141		
-Central Java	3	401	4.2	134		
3. Sumatra	3	479	5.1	160		
4. Sulawesi	1	75	0.8	75		
5. Kalimantan	0	0	0	-		
6. Others	0	0	0	-		
Total (Indonesia)	22	9,483	100	431	n.a.	n.a.

Source: BPS, unpublished figures.

Annex Table 13

Geographical distribution of ISIC 381, metal products, 1981

Area	Number of Establishments No.	Persons Engaged No.	Persons Engaged %	Avg. Plant Size Persons Engaged per Enterprise	Gross Output	Value Added
1. Jakarta	125	17,798	41.2	142		
2. Java	179	23,227	53.7	130		
-Yogyakarta	8	357	0.8	45		
-East Java	93	12,699	29.4	137		
-West Java	45	7,212	16.7	160		
-Central Java	33	2,959	6.8	90		
3. Sumatra	34	1,594	3.7	47		
4. Sulawesi	8	213	0.5	27		
5. Kalimantan	1	85	0.2	85		
6. Others	8	324	0.8	41		
Total (Indonesia)	355	43,241 (44,037)	100	5,405	n.a.	n.a.

Source: BPS, unpublished figures.

Annex Table 14

Geographical distribution of ISIC 382, non-electrical machinery, 1981

Area	Number of Establishments No.	Persons Engaged No.	Persons Engaged %	Avg. Plant Size Persons Engaged per Enterprise	Gross Output	Value Added
1. Jakarta	20	2,493	19.7	125		
2. Java	95	9,381	74.1	99		
-Yogyakarta	1	655	5.2	655		
-East Java	30	4,744	37.5	158		
-West Java	34	2,420	19.1	71		
-Central Java	30	1,562	12.3	52		
3. Sumatra	13	784	6.2	60		
4. Sulawesi	0	0	-	-		
5. Kalimantan	0	0	-	-		
6. Others	0	0	-	-		
Total (Indonesia)	128	12,658	100	99	n.a.	n.a.

Source: BPS, unpublished figures.

Annex Table 15

Geographical distribution of ISIC 383, electrical machinery, 1981

Area	Number of Establishments No.	Persons Engaged No.	Persons Engaged %	Avg. Plant Size Persons Engaged per Enterprise	Gross Output	Value Added
1. Jakarta	55	23,712	61.1	431		
2. Java	54	13,564	35.0	251		
-Yogyakarta	1	239	0.6	239		
-East Java	10	2,845	7.3	285		
-West Java	34	9,433	24.3	277		
-Central Java	9	1,047	2.7	116		
3. Sumatra	6	1,502	3.9	250		
4. Sulawesi	0	0	-	-		
5. Kalimantan	0	0	-	-		
6. Others	0	0	-	-		
Total (Indonesia)	115	38,778	100	337	n.a.	n.a.

Source: BPS, unpublished figures.

Annex Table 16

Geographical distribution of ISIC 384, transport equipment, 1981

Area	Number of Establishments No.	Persons Engaged No.	Persons Engaged %	Avg. Plant Size Persons Engaged per Enterprise	Gross Output	Value Added
1. Jakarta	58	22,318	62.1	385		
2. Java	93	11,174	31.1	120		
-Yogyakarta	1	151	4.2	151		
-East Java	41	4,885	13.6	119		
-West Java	28	3,484	9.7	124		
-Central Java	23	2,654	7.4	115		
3. Sumatra	18	1,122	3.1	62		
4. Sulawesi	5	504	1.4	101		
5. Kalimantan	7	189	5.3	27		
6. Others	11	642	1.8	58		
Total (Indonesia)	192 (188)	35,949	100	188	n.a.	n.a.

Source: BPS, unpublished figures.

Annex Table 17

Geographical distribution of ISIC 385, scientific, photographic equipment, 1981

Area	Number of Establishments	Persons Engaged		Avg. Plant Size	Gross Output	Value Added
	No.	No.	%	Persons Engaged per Enterprise		
1. Jakarta	2	92	9.0	46		
2. Java	24	918	89.7	38		
-Yogyakarta	10	263	25.7	26		
-East Java	6	326	31.9	54		
-West Java	4	230	22.5	58		
-Central Java	4	99	9.7	25		
3. Sumatra	1	13	1.3	13		
4. Sulawesi	0	0	-	-		
5. Kalimantan	0	0	-	-		
6. Others	0	0	-	-		
Total (Indonesia)	27	1,023	100	38	n.a.	n.a.

Source: BPS, unpublished figures.

Domestic Production of Electric Machinery and Equipment (ISIC 383), in Indonesia, 1980

	Unit	Physical production	Value (000 Rp.)	Price/Unit (Rp.)
1. Black and white TV	000 units	472	53,240,486	112,798
2. Integrated circuits	000 units	487,743	51,237,109	105
3. Colour TV	000 units	135	49,901,005	369,637
4. Dry cells	000 units	549,347	37,329,520	68
5. Electric cable	tons	16,423	22,931,804	1,396,323
6. Copper rods	tons	12,932	20,614,549	1,594,073
7. Radio tape recorders	000 units	540	19,994,025	37,026
8. Radios	000 units	990	16,814,324	16,984
9. Refrigerators	000 units	82	13,248,482	161,567
10. All other cables	000 meters	121,853	11,213,519	92
11. Accummulators	000 units	653	8,307,066	12,721
12. Air conditioners	000 units	37	7,985,937	215,836
13. Tape recorders	000 units	296	6,479,291	21,889
14. Cassette recorders	000 units	23,878	5,711,360	239
15. Fans	000 units	214	4,896,054	22,878
16. Lamp bulbs 1	000 units	29,171	4,197,489	144
17. Transformers	units	1,745	3,492,548	2,001,460
18. Plugs	000 units	11,457	3,218,561	281
19. BC	tons	1,656	2,919,108	1,762,746
20. TL lamps	000 units	4,964	2,756,536	555
21. Melamine sheets	000 sheets	603	2,413,644	4,002
22. Enamel wire	tons	817	2,254,546	2,759,542
23. Sewing machines	000 units	110	2,028,843	18,444
24. Other dry cells	-	-	1,596,101	-
25. Speakers	000 pieces	1,367	1,241,015	908
26. Electric panels	units	1,029	1,178,379	1,145,169
27. Transceivers	sets	242	1,143,596	4,725,603
28. Trafo TL	000 units	1,929	1,027,385	532
29. Gas appliances	000 sets	22	886,680	40,304
30. Amplifier	000 units	20	819,782	40,989
31. Tape decks	000 units	10	811,325	81,133
32. Switches	000 units	216	699,633	3,239
33. Speakers	000 units	48	672,000	14,000
34. Bulb lamps 2	000 units	34,772	629,487	18
35. PVC	tons	210	623,847	2,970,700
36. Cassettes, recorded	000 units	1,068	609,286	570
37. Exhaust fans	000 sets	31	608,156	19,618
38. Glass tubes TL	000 units	8,732	546,601	63
39. Separator accummulators	000 sheets	21,755	543,877	25
40. PVC - FM	000 units	2	525,000	262,500
41. Tuners	000 units	123	482,311	3,921
42. Accummulator plates	000 units	2,294	464,838	203
43. Rice cookers	000 sets	32	463,376	14,481
44. Transceivers	units	130	455,000	3,500,000
45. Switch board panels	units	700	420,000	600,000
46. Lamp base	000 units	22,824	413,114	18
47. Electric tools	000 coils	57	365,396	6,410
48. Transformers	000 units	118	333,484	2,826
49. Lamp talan	000 units	4	320,878	80,220
50. PVC AM	000 units	4	315,000	78,750
51. Decorative lamps	000 units	2,533	267,450	106
52. Radio sender/transmitter	000 units	560	246,957	441
53. Others	-	-	15,249,262	-
Total (gross output, ISIC 383)	-	-	387,144,415	-

Source: BPS: Survey of Industries, 1980.

Annex Table 19

Nominal and effective protection in Indonesian manufacturing, 1975

IO code	Sector name	Nominal rate of protection (%)	Effective rate of protection (%)
Exportable Sectors			
5	Dried cassava and tapioca flour	-10.00	-10.75
13	Smoking and remilling of rubber	-11.00	-10.90
18	Farm coconut oil	-10.00	-10.07
19	Palm Oil	-15.00	-4.61
22	Processed tobacco	-11.00	-11.89
26	Farm processed tea	-1.00	-11.89
34	Slaughtering	-4.00	-5.26
43	Fish slating and drying	0.00	-1.19
62	Coconut and cooking oil	-10.00	-11.04
69	Cocoa, chocolate and sugar confectionary	8.00	15.02
73	Other food products, not elsewhere classified	0.00	4.90
80	Batik industries	0.00	-35.19
85	Tanneries and leather finishing	0.00	1.89
88	Sawmills, planing and other wood processing	0.00	13.38
89	Wood and cord products	0.00	-1.20
Noncompeting Import Sectors			
118	Iron and steel basic industries	13.43	18.14
124	Non-electrical machinery	15.70	18.00
125	Electrical industrial machinery and apparatus	12.46	10.30
129	Other electrical apparatus, supplies and repair	15.55	-4.11
135	Aircraft industry	-4.33	-24.07
136	Professional and scientific instruments and repair	8.92	3.54
137	Photographic and optical goods	19.97	14.37
94	Basic industrial chemicals, excluding fertilizer	15.31	26.03
101	Pesticides and agricultural chemicals	17.26	30.65
102	Other chemical industries	47.55	411.05
Import-Competing Sectors			
58	Canning and preserving meat	61.91	neg. IVA
59	Diary products	40.00	221.36
60	Fruits and vegetables	68.21	208.87
61	Canning and preserving fish and other sea food	58.94	neg. IVA
63	Other vegetables and animal oils and fats	13.30	403.22
64	Rice milling, cleaning and polishing	-23.72	0.93
65	Wheat flour and other grain mill products	-15.00	neg. IVA
66	Sugar refinery	-7.44	-9.32
67	Bread and bakery products	16.12	82.69
68	Macaroni noddle and similar products	14.00	623.03
74	Alcoholic beverages	83.84	116.48
75	Soft drinks and carbonated water	56.61	106.08
76	Cigarettes	18.00	4.22
77	Spinning industries	14.00	56.00

IO code	Sector name	Nominal rate of protection (%)	Effective rate of protection (%)
78	Weaving industries	41.00	191.69
79	Textile bleaching, printing, dyeing excl. batik	22.00	42.01
81	Knitting industries	53.00	331.49
82	Made-up textile goods, excluding wearing apparel	58.69	297.63
83	Wearing apparel, excluding footwear	51.00	110.04
84	Carpets, rugs, ropes and others	27.54	101.42
86	Leather products, excluding footwear	57.62	152.65
87	Leather footwear	69.40	174.53
90	Furniture and fixtures, excluding those primary metal	15.00	51.90
91	Pulp, paper and cardboard	23.50	45.78
92	Paper products	51.04	87.29
93	Printing, publishing and allied industries	28.12	32.55
96	Paints, varnishes, lacquers	18.13	21.77
97	Drugs and medicines	73.88	150.49
98	Soap and cleaning preparations	48.67	neg. IVA
99	Cosmetics	77.55	315.21
100	Matches	34.23	77.17
109	Other petroleum and coal products	55.69	neg. IVA
110	Tyres and tubes	107.87	4,314.91
111	Other rubber products	46.82	406.40
112	Plastics	51.57	533.82
113	Ceramics	90.90	143.61
114	Glass and glass products	412.15	neg. IVA
115	Structural clay products	15.63	26.08
116	Cement	40.00	63.57
117	Other non-metallic mineral products	45.77	83.20
120	Cutlery, hand tools and general hardware	21.74	36.30
121	Furniture and fixtures, mainly metal	36.81	113.90
122	Structural metal products	15.15	17.47
123	Other fabricated metal products	32.10	66.10
126	Radio, television, communications equipment	67.00	210.01
127	Electrical appliances and housewares	70.00	340.82
128	Accumulators and dry batteries	39.07	116.37
130	Ship and boat building and repair	15.31	44.89
131	Railroad equipment	3.57	1.71
132	Motor vehicles	80.00	717.73
133	Motorcycles, bicycles and other vehicles	65.00	88.05
138	Jewellery and related articles	40.73	238.21
139	Musical instruments	49.84	122.90
140	Sports and athletic goods	24.84	31.46
141	Other manufacturing industries	62.14	430.23

Source: World Bank

Industrial Projects Cited in 16 August 1982 State Address

No.	Category/project/factory	Location	Status	Products	Capacity	Target completion date	Est. cost ($m)	Remarks
I.	BASIC CHEMICALS: 27 projects, total investment $9,198 m.							
1.	Fertilizer distribution	Multiple	New	Fertilizer marketing	-	n.a.	357	Capital cost involves purchase of bulk carriers and railway rolling stock, construction of packaging plants and ware-houses. Project underway.
2.	Kaltim Fertilizer I	E. Kal	New	Urea Amonia	570,000 tons/yr 165,000 tons/yr	1982	367	Trial operation has commenced.
3.	ASEAN Fertilizer	Aceh	New	Urea	570,000 tons/yr	1983	313	Under construction.
4.	Iskandar Muda Ferti-lizer	Aceh	New	Urea Amonia	1,725 tons/day 1,000 tons/day	1984	385	Site being prepared.
5.	PT Petrokimia	Gresik	Exp.	TSP	500,000 tons/yr	1983	117	(Includes harbour and water (purification plant.
6.	PT Petrokimia	Gresik	Exp.	Phosphoric and sulf. acid, gypsum	1.5m. tons/yr	n.a.	256	(Both plants under (construction.
7.	Kaltim Fertilizer II	E. Kal.	New	Urea Amonia	570,000 tons/yr 165,000 tons/yr	1984	375	Represents first phase expansion of Kaltim I. Now under construction.
8.	PN Leces Pulp and Paper	E.Java	Exp.	Writing/ priting paper	260 tons/day	1984	220	(Represents 3rd and 4th phase (expansion of Leces. Raw material: (bagasse. Phase III already (under construction. (
9.	PN Leces Pulp and Paper	E.Java	Exp.	Newsprint	90,000 tons/yr	1985	220	(

No.	Category/project/factory	Location	Status	Products	Capacity	Target completion date	Est. cost ($m)	Remarks
10.	Cilacap Pulp and Paper	W.Java	New	Kraft paper/ cement bags	90,000 tons/yr	1985	200	
11.	Integrated forest-based industry	E.Kal.	New	Plywood/timber prods. Pulp	203,500m^3/yr 165,000 tons/yr	1985	650	
12.	Olefin Centre[a/]	Aceh	New	Ethane Ethylene Caustic soda Other	450,000 tons/yr 340,000 tons/yr 251,000 tons/yr 540,000 tons/yr	1988	2,800	Exxon has tentatively agreed to major equity investment in ethane extraction-phase (est. $300 m.) Japanese and local partners envisaged for VCM, caustic soda, and EDC phase. Preliminary studies still in course.
13.	Aromatics Centre	S.Sum.	New	Benzene PTA Cyclohexana Other	256,000 tons/yr 225,000 tons/yr 180,000 tons/yr 66,000 tons/yr	1986	1,785	Main constrators: Thyssen/Pullman Kellog; design work underway.
14.	PT Semen Padang	W.Sum	Exp.	Cement	600,000 tons/yr	1983	138	Unit IIIA under construction.
15.	PT Semen Padang	W.Sum	Exp.	Cement	600,000 tons/yr	1984	132	Unit IIIB under construction.
16.	PT Semen Tonasa	S.Sul	Exp.	Cement	590,000 tons/yr	1984	144	Under construction.
17.	PT Semen Cibinong	W.Java	Exp.	Cement	800,000 tons/yr	1984	120	Site being prepared.
18.	Kupang Cement	NTT	New	Cement	120,000 tons/yr	1984	35	Described as 'mini' plant; under construction.
19.	Madura Cement	Madura	New	Cement	2m. tons/yr	n.a.	438	
20.	PT Semen Baturaja	S.Sum	Exp.	Cement	500,000 tons/yr	n.a.	130	

No.	Category/project/factory	Location	Status	Products	Capacity	Target completion date	Est. cost ($m)	Remarks
21.	Industrial Rubber	Cilegon	New	Industrial rubber products, heavy duty tyres	n.a.	n.a.	160	License issued.
22.	Soda ash project	Gresik	New	Soda ash	200,000 tons/yr	n.a.	120	
23.	Industrial salt proj.	NTT	New	Industrial salt	n.a.	n.a.	90	
24.	Polyester Factory[a/]	Gresik	New	Polyester	n.a.	n.a.	(175	Under construction.
25.	Polyester Factory[a/]	Cilegon	New	Polyester	n.a.	n.a.	(	
26.	Ammonium nitrate factory	W.Java	New	Amm. nitrate for explosives	n.a.	n.a.	56	
27.	Dissolving pulp proj.	S.Sum	New	Rayon fibre	n.a.	n.a.	400	
II.	BASIC METALS: 18 projects, total investment $2,226m.							
28.	Pellet factory[b/]	Cilegon	n.a.	Iron pellets	3m. tons/yr	1984	130	Under construction[b/].
29.	Slab factory and Hot Strip Mill b/	Cilegon	n.a.	Slab and hot strip	n.a.		n.a.	Project completed[b/].
30.	Cold Sheet Mill	Cilegon	n.a.	Cold rolled sheet	500,000 tons/yr	1983	490	
31.	Tin plate factory	Cilegon	n.a.	Tin plate	60-100,000 tons/yr	1985	57	
32.	Seamless pipe factory	n.a.	new	Seamless pipe	150,000 tons/yr	1985	186	
33.	Diesel/gasoline engine factory	Java	New	Diesel/gasoline engines	200,000 units	1984	448	License issued.
34.	Shipyards	Jkt/S'baya UP/Palbg	New	(New ships (Repairs	21,000 BRT 540,000 BRT	1984	50	Construction underway.

No.	Category/project/factory	Location	Status	Products	Capacity	Target completion date	Est. cost ($m)	Remarks
35.	Casting prods. factory	Cilegon	n.a.	Casting products	48,000 tons/yr	1984	91	
36.	Forging prods. factory	Cilegon	n.a.	Parts, chassis, transmissions	31,000 tons/yr	1984	75	
37.	Machine tool factory	Cilegon	n.a.	Lathes	650 units	1984	4	License issued.
38.	Heavy equipment fact.[a]	Java	New	Wheel loaders	2,980 units	n.a.	(	
				Crawler tractors	700 units		(147	
				Excavators	100 units		(	
39.	Railway carriage fact.	Madiun	New	Freight cars	200 units	1984	96	Under construction.
				Passenger cars	42 units			
40.	Power train factory	Jkt. or Sby.	New	Suspension/ steering systems for motor vehicles	150,000 units	1985	38	
41.	Motorcycle engine factory	Jkt. or Sby.	New	Motorcycle engines	200,000 units	1985	17	
42.	General Machinery	Jkt. or Sby.	New	Sugar, palmoil mill and crumb rubber	465,000 tons/yr	1985	235	
43.	Copper cathode fact.	O.I.	New	Copper cathodes	40,000 tons/yr	1985	130	
44.	Heavy elect. machinery	Jkt. or Sby	New	Heavy elect. eqpt.	n.a.	1985	28	
45.	Die and Mould factory	n.a.	New	Dies and moulds	n.a.	1985	5	

No.	Category/project/factory	Location	Status	Production	Capacity	Target completion date	Est. cost ($m)	Remarks
III.	LIGHT MANUFACTUIRNG: 7 projects, total investment $369m.							
46.	PT Sandang I	W.Java	Exp.	(Weaving yarn and improvement in quality	n.a.	1983	74	Expansion to 90,000 spindles.
47.	PT Sandang II	E. Java	Exp.	(	n.a.	1983	99	Expansion to 120,000 spindles.
48.	PT Primissima	Yogya	Exp.	(	n.a.	1982	50	Expansion to 60,000 spindles.
49.	Pinda Sandang	C.Java	Exp.	(	n.a.	1983	25	Expansion to 30,000 spindles.
50.	PN Garam	Madura	Exp.	Salt	300,000 tons/yr	1986	25	Rehabilitation (production includes present output). Contract signed.
51.	Science-based Indust. Park	Jkt./Bdg.	New	Electronics	n.a.	1985	19	
52.	Electronic Component Plt.	Bdg.	New	Electronics components	n.a.	1985	75	
IV.	PERTAMINA REFINERY AND PETROCHEMICAL PLANNED PROJECTS NOT INCLUDED ABOVE: 6 projects $6,387m.							
1.	Cilacap Refinery	Cilacap	Exp.	Refinery products	215 MBSD	1983	1,178	Pertamina share $223m, main contractor Fluor Eastern Inc. Construction 31% completed.
2.	Balikpapan Refinery	E.Kal	Exp.	Refinery products	228 MBSD	1983	1,509	Pertamina share $385m, main contractor Bechtel Internatl. Construction 13% completed.
3.	Dunai Hydrocracker	Riau	New	Refinery products	82 MBSD	1983	1,521	Pertamina share $370m, main contractor Tecnicas-Reunidas/ Centurion. Construction 7% completed.

No.	Category/project/factory	Location	Status	Products	Capacity	Target completion date	Est. cost ($m)	Remarks
4.	Methanoi Project	E.Kal	New	Methanol	330,000 tons/yr	1985	341	Land clearing almost completed.
5.	Arun LNG Refinery	Aceh	Exp.	LNG	3.3m. tons/yr	1984	842	Main contractor Choyoda Chem. Eng. Construction 2% completed.
6.	Badak LNG Refinery	E.Kal	Exp.	LNG	3.3m. tons/yr	1983	996	Main contractor Bechtel Internatl. Construction 28% completed.

Source: Ministry of Industry, 'Long Range Development Plan of Indonesia', Jakarta, 14 October 1982; and Pertamina.

Notes: a/ Planned as joint venture.
b/ Not clear whether these and other projects in Cilegon are to be regarded as extensions of PT Krakatau Steel.

Supply and Demand Estimates ISIC (37) and ISIC (38), 1982-1987

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
38391	Storage battery and its components industry:							
	- Storage battery	85.04.191	Thousand pieces	4,059 3,521 4,700	7,646 6,116 5,097	8,288 6,630 5,525	8,986 7,189 5,990	9,748 7,799 6,499
38392	Battery industry:							
	- Dry battery	84.03.110	Thousand pieces	682,420 576,600 632,345	1,028,871 823,097 685,914	1,115,452 892,362 743,635	1,209,450 967,560 806,300	1,312,263 1,049,810 874,842
	Two-wheel motor vehicle industry:							
38411	- Motor Bicycle	87.09	Thousand pieces	750 577.4 488.5	1,050.0 609.3 529.8	1,170 660.5 574.3	1,170 716.1 622.7	1,470 776.9 675.6
37101	Basic iron and steel industry:							
	- Pellet		Thousand tons	- - 704	- - 1,440	- - 1,980	- - 2,340	- - 2,700
	- Sponge iron	73.05.200	Thousand tons	2,000 391 350.5	2,000 800 700	2,000 1,100 900	2,000 1,300 1,100	2,000 1,500 1,300
	- Slab	73.07.930	Thousand tons	1,100 - 950	1,100 200 1,100	1,100 400 1,300	1,100 600 1,545	1,100 900 1,700
	- Ingot billet	73.06.200/ 73.07.100	Thousand tons	1,175 693.5 950	1,175 762 1,271	1,175 800 1,398	1,175 1,000 1,538	1,175 1,100 1,690

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
37102	Metal foundry engineering Industry:							
	- Iron smelting	73.01.200	Thousand tons	71	71	71	71	71
				70	71	71	71	71
				93.5	110	140	170	200
	- Steel smelting	73.01.200	Thousand tons	6.5	6.5	6.5	6.5	6.5
				2.5	2.8	3.23	3.72	4.3
				2.7	3.4	4.25	5.3	6.62
37103	Steel rolling and milling industry:							
	- Hot coil	73.11.200	Thousand tons	1,100	1,100	1,100	1,100	1,100
				10	241	432	650	970
				865	1,000	1,150	1,530	1,500
	- Cold rolled sheet	73.15.900	Thousand tons	-	-	-	-	850
				-	-	-	-	255
				-	600	700	845	950
	- Tin plate	73.13.100	Thousand tons	-	-	-	130	130
				-	-	-	-	78
				146.20	174	192	210	225
	- Reinforced steel/ light profile	73.10.932	Thousand tons	1,200	1,200	1,200	1,200	1,200
				745	1,026	1,200	1,200	1,200
				743.8	976	1,100	1,243	1,405
	- Steel wire	73.10.100/ 73.15.300	Thousand tons	416	416	416	416	416
				257.4	300	340	384	416
				257.4	300	340	384	434
	- Zinc plate	73.10.900	Thousand tons	490.8	490.8	490.8	490.8	490.8
				329.5	419	474	490.8	490.8
				329.5	419	474	535	604

(Annex Table 21 continued)

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
38194	Pipe industry:							
	- Straight welded pipe	73.17.100	Thousand tons	375 237 300	375 345 345	375 375 396	375 375 448	375 375 506
	- Spiral welded pipe	73.17.900	Thousand tons	60 46.10 46.19	60 50 50	60 60 85	60 60 115	60 60 140
	- Seamless pipe	73.18.100	Thousand tons	- - 113.75	- - 130	- - 150	- - 175	160 48 200
37201	Non iron metal making industry:							
	- Aluminium ingot	76.01.200	Thousand tons	225 12 20.4	225 115 24	225 175 27.6	225 225 31.7	225 225 36.5
	- Copper rod	74.03.200	Thousand tons	36 18.5 20	36 26 26	36 30 30	36 34.5 34.5	36 36 40
	- Copper cathode	74.01.400	Thousand tons	- - 44.6	- - 49.5	- - 51.5	- - 59	- - 65
	- White tin ingot		Thousand tons	33 33 0.43	33 33 0.5	33 33 0.575	33 33 0.66	33 33 0.76
37203	Non iron metal rolling industry:							
	- Aluminium sheet	76.03.100	Thousand tons	21 10.5 18.5	21 21 22	21 21 25	21 21 29	21 21 33

(Annex Table 21 continued)

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
37204	Non iron metal extrusion industry:							
	- Aluminium extrusion	76.02.900	Thousand tons	17	17	17	17	17
				12.3	16.5	17	17	17
				15.7	16 8	21	23	26
38212	Combustion engineering industry:							
	- Diesel stationer	84.06	Unit	88,664	88,664	88,664	88,664	88,664
				70,455	70,455	67,160	69,220	80,640
				170,000	192,000	210,000	222,000	233,000
38220	Agricultural machinery and accessories industry:							
	- Mini tractor	87.01.921	Unit	200	5,000	6,000	7,000	8,250
				116	3,000	4,500	6,000	8,250
				2,000	5,000	10,000	13,000	13,000
	- Hand tractor	87.01.942	Unit	2,150	5,000	10,000	15,000	18,790
				1,271	3,000	8,000	13,000	18,750
				5,500	5,000	10,000	14,000	19,000
	- Big tractor	87.0.122	Unit	-	-	-	-	2,000
				-	-	-	-	-
				1,350	1,500	1,650	1,800	1,900
	- Tresher	87.02.530	Unit	2,500	2,500	2,500	2,500	2,500
				1,274	1,279	1,400	1,550	1,700
				825	1,025	1,025	1,416	1,670
	- Huller	84.29.119	Unit	6,100	6,100	6,100	6,100	6,100
				1,654	1,687	1,800	1,900	2,050
				33,000	34,000	39,000	46,000	54,000
	- Polisher	84.25.400	Unit	3,520	3,520	3,520	3,520	3,520
				338	338	370	410	450
				33,000	34,000	39,000	46,000	54,000

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
	- Rice milling unit	84.29.190	Unit	1,570 372 1,000	1,570 800 1,300	1,570 1,000 1,500	1,570 1,200 1,700	1,570 1,500 1,900
	- Rice Milling plant		Unit	8,000 372 5,000	8,000 372 6,000	8,000 400 7,200	8,000 430 8,700	8,000 460 10,400
	- Irigation water pump	84.10.300	Unit	7,200 2,110 4,600	7,200 2,110 5,500	7,200 2,230 6,600	7,200 2,450 8,000	7,200 2,700 9,500
38231	Metal processing/working machinery industry:							
	- Lathe machine	84.45.200	Unit	300 27 2,500	300 327 3,010	300 327 3,360	300 327 3,780	300 327 4,200
	- Bench drinlling machine	84.45.400	Unit	1,000 71 4,900	1,000 100 5,500	1,000 120 5,750	1,000 140 5,875	1,000 160 6,000
	- Sawing machine	84.45.500	Unit	4,000 120 6,900	4,000 120 8,400	4,000 120 8,800	4,000 120 8,960	4,000 120 9,120
	- Milling machine	84.45.610	Unit	250 25 500	250 25 560	250 25 600	250 25 650	250 25 700
	- Bending machine		Unit	100 25 600	100 25 650	100 50 700	100 100 750	100 100 800
38292	Heavy equipment industry:							
	- Road/vibro roller	84.09	Unit	1,140 404 200	1,140 404 500	1,140 424 525	1,140 445 551	1,140 467 579
	- Stone crusher	84.09	Unit	590 18 100	590 18 100	590 20 110	590 22 122	590 25 134

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
	- Concrete mixer	84.09	Unit	2,000	2,000	2,000	2,000	2,000
				1,200	1,200	1,300	1,430	1,570
				1,300	1,500	1,650	1,800	1,900
	- Compactor plate	84.09	Unit	500	500	500	500	500
				400	400	440	480	520
				450	500	550	600	660
	- Wheel loader	84.09	Unit	335	335	335	335	335
				-	-	134	201	300
				270	300	335	360	400
	- Motor grader	84.09	Unit	265	265	265	265	265
				-	-	106	159	239
				120	150	188	234	293
	- Excavator	84.09	Unit	450	450	450	450	450
				-	-	180	279	405
				395	490	579	683	806
	- Buldozer	84.09	Unit	1,240	1,240	1,240	1,240	1,240
				-	-	496	744	1,116
				1,360	2,000	2,140	2,280	2,420
38312	Electric motor industry:							
	- Electromotor	85.01	Piece	16,830	17,000	18,700	20,500	22,627
				1,470	5,530	5,710	5,990	6,290
				456,065	501,670	551,830	607,020	667,720
38313	Transformer industry:							
	- Transformer	85.01	Piece	9,350	9,350	10,285	11,310	12,440
				4,964	5,450	5,990	6,590	7,250
				5,660	6,620	7,280	8,010	8,820
38314	Electric panel and switch gear industry:							
	- Electric panel	85.01	Piece	15,600	17,160	18,876	20,750	22,825
				10,656	11,840	12,430	13,050	13,700
				64,166	70,580	77,640	85,400	93,940

(Annex Table 21 continued)

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
38316	Other electrical machinery industry:							
	- Generator and generator set	85.01	Piece	62,520	62,575	68,830	75,710	83,280
				26,357	29,080	31,990	35,190	38,610
				50,383	55,420	60,960	67,050	73,750
38321	Radio, TV, entertainment electronic equipment and accessories industry:							
	- Colour TV set	85.15.219	Set	700,000	700,000	700,000	700,000	700,000
				225,000	275,000	315,000	342,000	371,000
				300,000	318,000	340,000	360,000	380,000
	- Black & white TV set	85.15.221	Set	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000
				425,000	468,000	514,000	566,000	622,000
				650,000	690,000	732,000	775,000	822,000
	- Radio/radio cassette		Set	4,950,000	4,950,000	4,950,000	4,950,000	4,950,000
				1,590,000	1,750,000	1,925,000	2,115,000	2,326,000
				1,750,000	1,855,000	1,966,00	2,084,000	2,189,000
	- Cassette record	92.11.931	Set	781,500	781,500	781,500	781,500	781,500
				355,900	392,000	430,000	474,000	521,000
				390,000	415,000	440,000	465,000	493,000
	- Amplifier	92.11.990	Unit	143,000	143,000	143,000	143,000	143,000
				12,600	13,900	15,300	16,800	18,500
				14,000	14,900	15,700	16,700	17,000
	- Cassette Deck	85.14.130	Set	41,000	41,000	41,000	41,000	41,000
				22,100	24,500	27,000	29,500	32,500
				24,000	25,500	27,000	28,500	30,000
	- Loudspeaker	85.14.120	Unit	2,368,000	2,368,000	2,368,000	2,368,000	2,368,000
				1,035,000	1,100,000	1,163,000	1,233,000	1,307,000
				1,115,000	1,182,000	1,253,000	1,328,000	1,408,000
	- Car radio	85.15.319	Set	126,000	126,000	126,000	126,000	126,000
				69,000	73,000	77,500	82,000	87,000
				75,000	79,500	84,500	89,500	95,000

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
38322	Communication equipment industry:							
	- Telephone set[a]	85.13	Unit	40,300 32,000 90,000	40,300 40,000 100,000	46,300 46,000 115,000	53,200 53,000 132,000	61,200 61,000 152,000
	- Radio mobile[a] telephone	85.15.400	System (base/ mobile)	20/4,000 10/2,000 40/8,000	20/4,000 15/3,000 50/10,000	23/4,600 20/4,000 60/12,000	26/5,200 23/4,600 70/14,000	30/6,000 26/5,200 80/16,000
	- Rural telephone[a]	85.13	System (base/ subs)	30/1,500 15/750 50/2,500	30/1,500 20/1,000 60/3,000	30/1,500 23/1,150 70/3,500	30/1,500 26/1,300 80/4,000	35/1,750 30/1,500 90/4,500
	- Central telephone (Analog)	85.13.113	Line Unit	40,000 22,000 45,000	40,000 25,000 50,000	40,000 29,000 57,000	40,000 33,000 66,000	40,000 38,000 76,000
	- Small earth satellite	-	Unit	130 50 50	130 50 50	130 60 60	130 65 65	130 70 70
	- High frequency - Single side band	-	Unit	3,500 950 2,250	3,500 1,050 2,500	3,500 1,150 3,000	3,500 1,250 3,500	3,500 1,400 4,000
	- Very high frequency/ Ultra high frequency Single channel	-	Unit	5,500 1,400 2,000	5,500 1,550 2,500	5,500 1,800 3,000	5,500 1,950 4,500	5,500 2,200 5,000
	- TV relay station	-	Unit	600 50 100	600 70 120	600 90 130	600 100 140	600 120 150
	- Radio Broadcast	-	Unit	100 10 100	100 30 100	100 50 110	110 75 120	120 100 130

(Annex Table 21 continued)

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 Capacity -Production -Demand
	- Radio transmitter	-	Unit	50	50	50	50	50
				-	10	15	30	40
				30	30	35	40	45
	- Multiplex		Channel	5,000	5,000	5,000	5,500	6,000
				-	2,500	3,000	3,500	4,000
				6,000	6,000	6,000	6,500	7,000
	- Radio head		System	200	200	250	300	350
				100	150	200	250	300
				350	375	400	425	450
	- Radio and wind sender/ transmitter		Unit	15,000	15,000	15,000	15,000	15,000
				2,000	2,500	3,000	3,500	4,000
				5,000	6,000	7,000	8,000	9,000
	- PABX [a/]		Line	36,500	36,500	42,000	48,000	55,000
			Unit	-	36,000	41,500	47,500	55,000
				80,000	90,000	100,000	120,000	135,000
38330	Household electrical equipment industry:							
	- Refrigerator	84.15.391	Unit	340,000	340,000	340,000	340,000	340,000
				153,000	162,000	172,000	182,000	193,000
				161,000	171,000	181,000	192,000	203,000
	- Air conditioner	84.15.310	Unit	142,000	142,000	142,000	142,000	142,000
				55,000	58,300	61,800	65,500	69,500
				57,500	61,000	65,000	68,500	73,000
	- Fan	85.06.219	Unit	878,000	930,000	987,000	1,045,000	1,108,000
				756,000	801,000	849,500	900,500	955,000
				815,000	864,000	916,000	971,000	1,029,000
	- Electric iron	85.12.400	Unit	550,000	550,000	550,000	550,000	550,000
				33,700	35,700	37,900	40,200	42,500
				35,500	38,000	40,000	42,500	44,800

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
	- Rice cooker	85.12.520	Unit	53,200	58,500	64,500	70,800	78,000
				49,000	52,000	55,000	58,500	62,000
				51,500	55,000	58,000	61,500	65,000
38394	Electric and telephone cable industry:							
	- Electric cable	85.23.110	Ton	53,170	56,500	60,000	63,500	67,000
				40,000	42,500	45,000	47,500	50,500
				70,000	80,500	92,500	106,500	122,500
	- Telephone cable	85.23	Ton	8,000	8,500	9,000	9,500	10,000
				7,000	7,500	8,000	8,500	9,000
				14,000	16,000	18,500	21,500	24,500
38411	Shipbuilding and shipyard industry:							
	- New ship	89.01						
	- up to 500 GRT		GRT	33,650	33,650	33,360	33,650	33,650
				-	26,920	26,920	26,920	48,456
				-	19,047	11,761	20,490	30,142
	- from 501 to 2,000 GRT		GRT	40,600	40,600	40,600	40,600	40,600
				-	28,420	28,420	28,420	55,216
				-	40,353	44,461	47,801	52,570
	- from 2,001 to 5,000 GRT		GRT	19,500	19,500	19,500	19,500	19,500
				-	11,700	11,700	11,700	20,280
				-	29,682	31,245	32,696	44,041
	- from 5,001 to 10,000 GRT		GRT	13,000	13,000	13,000	13,000	13,000
				-	6,500	6,500	6,500	9,100
				-	15,301	15,658	16,044	21,464
38414	Ship repairs industry:							
	- Ship repairs	89.						
	- up to 500 GRT		GRT	16,048	16,048	16,048	16,048	16,048
				-	160,319	160,319	160,319	180,540
				-	198,131	208,505	217,500	230,768

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
	- from 501 to 2,000 GRT		GRT	13,940	13,940	13,940	13,940	13,940
				-	119,332	119,332	119,332	139,380
				-	385,850	411,727	439,680	492,200
	- from 2,0001 to 5,000 GRT		GRT	12,920	12,920	12,920	12,920	12,920
				-	110,595	110,595	110,595	119,380
				-	271,007	295,896	328,996	362,107
	- from 5,001 to 10,000 GRT		GRT	8,840	8,840	8,840	8,840	8,840
				-	75,670	75,670	75,670	81,682
				-	227,454	248,868	267,971	295,291
	- from 10,001 to 30,000 GRT		GRT	42,160	42,160	42,160	42,160	42,160
				-	316,200	316,200	316,200	337,280
				-	1,317,838	1,393,335	1,462,511	1,560,212
38421	Railway, parts and train accessories industry:							
	- Frieght car	86.07.000	Piece	300	300	600	600	600
				50	300	512	512	512
				800	900	950	994	1,000
	- Passenger car[a/]	86.05.000	Piece	-	-	50	50	50
				-	-	50	50	50
				168	173	188	195	208
	- Diesel rail[a/]	86.03.120	Piece	-	-	-	-	-
				-	-	-	-	-
				16	20	26	32	36
	- Electric rail[a/]	86.02.000	Piece	-	-	-	-	-
				-	-	-	-	-
				27	36	44	51	55
	- Locomotive[a/]	86.03.110	Piece	-	-	-	-	-
				-	-	-	-	-
				36	45	55	60	65

(Annex Table 21 continued)

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
38431	Four- or more wheel motor vehicle industry:							
	- Passenger vehicle	87.02.221	Unit	52,515	52,515	52,515	52,515	52,515
				29,710	34,170	39,290	45,180	51,950
				29,710	34,170	39,290	45,180	51,950
	- Commercial vehicle	87.02	Unit	297,585	297,585	297,585	297,585	297,585
				196,550	226,070	259,940	297,585	297,585
				196,550	226,070	259,940	298,930	343,770
38432	Four- or more wheel motor vehicle equipment and body industry:							
	- Fuel engine	-	Thousand units	-	-	-	425	425
				-	-	-	36.5	149.2
				81.0	92.4	103.0	114.9	128.1
	- Diesel engine[a/]	-	Thousand units	-	-	185.5	185.5	185.5
				-	-	77.0	85.0	94.0
				83	85.9	87.2	97.2	108.4
	- Cabin	-	Thousand units	149.6	149.6	149.6	149.6	149.6
				94.9	105.0	115.0	126	139.0
				145.5	165.5	184.6	205.8	229.5
	- Chassis/frame	87.061.60	Thousand units	178	178	178	178	178
				94.9	105	115	126	139
				140	178.0	198.5	221.3	246.8
	- Axle[a/]		Thousand units	-	-	-	294	294
				-	-	-	256.6	286.2
				180	206.4	230.2	256.6	286.2
	- Transmission[a/]		Thousand units	-	-	-	-	-
				-	-	-	-	-
				155.0	178.0	198.5	221.3	246.8
	- Propeller shaft[a/]	-	Thousand units	-	-	-	264	294
				-	-	-	221.3	246.2
				151.0	178.0	198.5	221.3	246.2

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
	- Rear body[a]	-	Thousand units	137.6	137.6	137.6	137.6	137.6
				99.7	105.6	117.9	137.4	137.6
				97.7	105.8	117.9	131.4	146.6
38451	Aeroplane and accessories industry:[b]							
	- Aeroplane (fixed wing)							
	- C.212		Unit	24	24	24	24	24
				12	15	16	18	24
				30	32	34	36	38
	- CN.235		Unit	-	-	11	11	11
				-	-	1	3	7
				-	-	15	20	25
	- Helikopter							
	- BO-105		Unit	36	36	36	36	36
				12	17	18	20	22
				5	20	22	24	26
	- Puma		Unit	12	12	12	12	12
				7	6	7	8	10
				-	-	-	-	-
	- BK 117		Unit	-	-	18	18	18
				-	-	1	6	10
				14	16	18	20	22
38131	Prefabricated metal building material industry except aluminium:							
	- Steel construction	73.32.220	Ton	25,000	28,000	36,000	47,000	60,000
				17,500	25,000	32,500	43,000	55,000
				64,000	70,750	77,820	85,000	94,000
	- Steel tank	73.40.390	Ton	11,097	16,000	21,000	28,000	35,000
				8,145	15,930	21,000	28,000	35,000
				54,000	42,000	46,000	51,000	56,000

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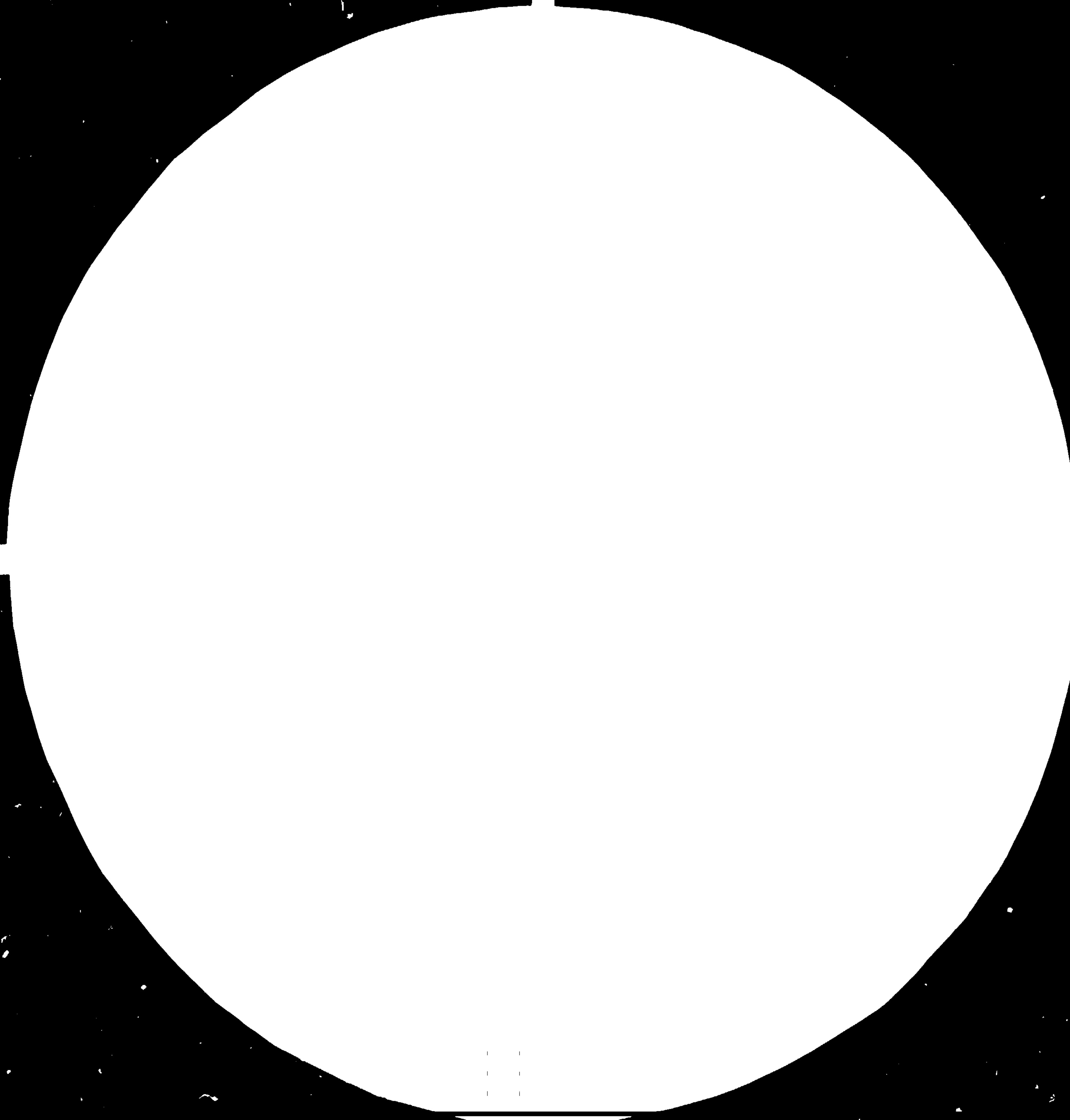

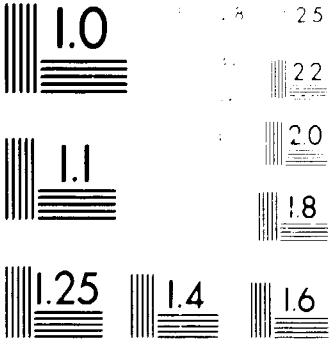
1.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

ISIC	Commodity	CCCN	Unit	1982/1983 -Capacity -Production -Demand	1983/1984 -Capacity -Production -Demand	1984/1985 -Capacity -Production -Demand	1985/1986 -Capacity -Production -Demand	1986/1987 -Capacity -Production -Demand
	- Boiler	73.37.000	Ton	10,200	10,200	10,200	10,200	10,200
				3,105	4,000	5,200	7,000	9,000
				14,000	16,000	18,000	20,000	22,000
	- Material handling	73.27.400	Ton	3,800	3,800	4,500	5,400	6,500
		73.29.190		3,800	3,800	4,500	5,400	6,500
		73.16.210		10,200	11,300	12,400	13,600	14,900
	- Milling equipment	84.10.100	Ton	3,000	3,000	3,500	4,200	5,000
		84.10.200		1,000	2,000	3,500	4,200	5,000
		84.10.300		8,200	9,000	9,700	10,900	12,000
	- Pumps	84.10.100	Ton	-	500	1,000	1,200	1,500
		84.10.200			500	1,000	1,200	1,500
		84.10.300			8,400	9,300	10,200	11,000
	- Other standard equipments	-	Ton	1,000	1,000	1,000	1,300	1,600
				700	700	1,000	1,300	1,600
				1,200	1,400	1,600	1,800	2,000

Source: The Development of National Capacity in Industry for 1983-1986, Summary, Ministry of Industry, Republic of Indonesia, 1983 (unofficial translation).

Notes: a/ New investment/development.
b/ Production and demand depend upon orders.

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INDONESIA INDUSTRY SECTOR SUTDY*
US/INS/82/106
INDONESIA

Part IV. Long-term Projections of Demand for Capital Goods in Indonesia

Prepared by the

Regional and Country Studies Branch
Division for Industrial Studies

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The UNIDO INDONESIA INDUSTRY SECTOR STUDY comprises the following six parts:

Part I	Main Report
Part II	Industrial Development in Indonesia - Past Trends and Future Prospects
Part III	Survey of Capital Goods and Engineering Industries
Part IV	Long-Term Projections of Demand for Capital Goods in Indonesia
Part V	Potential for Development of a Selective Capital Goods Industry
Part VI	Capital Goods Production in Developing Countries: International Experience

THIS DOCUMENT CONTAINS PART IV.

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Part IV. Long-term Projections of Demand for Capital Goods in Indonesia

Chapter I. Some Theorectical Considerations

All economic forecasting is difficult, and forecasting the demand for capital goods particularly so.

Capital requirements and investment. The first point to note is the distinction between "needs" and effective demand, between capital (goods) requirements and actual investment. Investment decisions are influenced by a variety of factors, psychological ones such as business confidence in the case of private investors and planning errors in the case of public investment, as well as cost and availability of finance, which cause the rate of investment to be only loosely related to capital requirements, certainly in its timing. Even were it possible to forecast capital requirements reasonably accurately, therefore, this would not necessarily provide precise guidance on the flow of orders to the capital goods producing industry and to the capacity needed in that industry in any short period.

The acceleration principle. Capital goods are required to produce consumer, intermediate or other capital goods. For any given technology, a particular stock of fixed capital (e.g. machines) is required to produce a particular annual flow of output of finished products. This relationship underlies the acceleration principle according to which the rate of investment (i.e. of additions to the stock of capital) is a function of the increase of output of finished products,

$$I = (\Delta K) = f(Y_{t+1} - Y_t)$$

where I is the rate of investment, K the capital stock and Y the level of output or income.

The investment determined by the acceleration principle is only one component of total investment. Another component is inventory investment.

The capital stock consists of fixed capital and stocks or inventories (of raw materials, work in process and finished products awaiting sale). Since inventory investment does not involve capital goods, this component can be ignored here. A third component is replacement investment, to make good depreciation and obsolescence of the existing stock of fixed capital. This component clearly cannot be ignored, since the demand for capital goods in any period is the sum of demand for expansion of existing capacity, or net investment (as determined by the acceleration principle), and replacement investment. It is gross fixed capital formation, net investment plus replacement investment, that determines the demand for capital goods. Forecasting the demand for capital goods, therefore, requires estimates of future demand for both net investment and replacement investment.

Net Investment. The coefficient in the above equation which relates the increase in capital stock required to sustain a given increase in output or income to that increase is sometimes called the incremental capital-output ratio (ICOR). It is possible to make statistical estimates over some past period of the ICOR for a whole economy or for particular sectors (such as agriculture or manufacturing) or sub-sectors (such as the textile or engineering industries). What determines the ICOR (interpreted in terms of capital requirements rather than actual investment)?

In any given capital-using activity, the ICOR is determined, in the first instance, by the method of production or "technology". The more capital-intensive the method of production, the higher, cet. par., will be the ICOR. A high ICOR does not, in itself, say anything about the economic efficiency or inefficiency of the industry. Whether a high ICOR is efficient depends on relative factor prices; it will be efficient to use capital-intensive technology if labour is relatively expensive (and capital cheap) but not if labour is plentiful (cheap) and capital scarce (expensive). A high ICOR may, however, be an indication of inefficient use of the existing capital stock. The extra output obtained from a given increase in capital stock may be relatively small, either because the capital stock remains underutilised or because of other sources of inefficiency (most of which derive from under-utilisation or inappropriate use of capital or labour). One determinant of the ICOR, therefore, is the efficiency with which capital is used (since, appropriately defined, the ICOR is the reciprocal of the marginal productivity of capital).

Since different industries (and different firms within industries) employ widely different methods of production (with different degree of capital intensity) and employ their capital and labour with different degrees of efficiency, there will evidently be considerable differences between statistically estimated average ICORs for different industries in any given past period and probably also in different past periods. Estimates of average ICORs for whole national economies vary generally between 3 and 6. ICORs for different industry branches range from 1 or less in relatively labour-intensive manufacturing industries to as high as 8-10 for very capital-intensive industries.

Replacement investment. Capital equipment wears out, through time and use. Each piece of capital equipment, therefore, has a certain physical life-span which can be measured by a rate of depreciation. Replacement investment is required to make good depreciation. (Current expenditure on repair and maintenance may prolong the life of a machine, so that there is some trade-off between current and capital expenditure). In addition to the effects of time and use, there is the effect of technical change. Some of the existing fixed capital stock may be rendered obsolete or uneconomic to use because a new type of equipment, embodying new technolgy, makes it possible to produce the same output (quality for quality) at lower cost, allowing for the capital charges on the new equipment.

While the rate of replacement of any given piece of equipment is determined by the rate of depreciaton and obsolescence, the rate of required replacement investment in a whole industry is also determined by the average age of its capital stock. If much of it is of recent vintage, the rate of required replacement in the near future will be relatively low, and vice versa.

Aggregate demand. If the task is to estimate demand for capital goods in the economy as a whole, not merely for individual capital-using industries, there remains the further problem of forecasting future rates of growth of demand for the final products of the whole range of capital-using industries. The methodological problems are familiar but formidable. In a closed economy, the problem can be stated formally in terms of forecasting the rate of growth of GDP and income (or output) elasticities of demand for the various categories of final product. In an open economy, allowance must also be made for that part of the domestic demand for each category that is expected to be met by imports and the addition to domestic demand likely to be made by exports.

Determinants of demand for capital goods. The purpose of the preceeding brief exposition has been to identify the elements that must enter into any estimates of future demand for capital goods.

To estimate future demand for net investment, it is necessary to estimate (a) future growth of output of finished products and (b) the relevant ICORs. Future growth of output will depend on future growth of domestic demand for the product, less that part of doemstic demand that is met by imports, plus demand for export. The relevant ICORs will depend on the average capital intensity and average efficiency of resource use among the firms of an industry sub-sector or among the sub-sectors of an industry branch. To estimate demand for replacement investment, it is necessary to estimate the future rate of depreciation and obsolescence and the average age of the capital stock of industries and branches.

For all these variables it may be possible to obtain statistical data for some past period, although this cannot be taken for granted. It is another matter to project from such past experience into the future. Various econometric techniques exist for doing so, from simple extrapolation of time series to more sophisticated estimation on the basis of assumed functional relationships. But it is clear that a very large margin of error necessarily attaches to any such estimates, whatever the technique used.

If the ultimate purpose of estimates of future demand for capital goods is to guide planning for the establishment of domestic capital goods (producing) industries, precise estimates of future demand for capital goods are not really necessary for an open economy. Domestic demand can be met by imports and supplemented by exports. All that is needed, therefore, for each type of capital good is to determine, as far as possible, whether (a) domestic demand is likely to be sufficient for economically efficient (optimum scale) domestic production and, if not, (b) whether there are prospects for export sufficient to enable domestic production to reach this volume; and (c) whether domestic production is likely to be competitive with imports, subject to some maximum rate of effective protection (say, 20 or 30 per cent).

The purpose of the following chapters is to provide an economic study of future demand for capital goods in Indonesia. The forecast covers the demand for a selected group of capital goods by product for the years 1985, 1990 and 2000 under alternative hypotheses about the rates of growth of GDP and sectoral shares. These forecasts are to be used in formulating a strategy for domestic capital goods production.

Chapter II. The Methodology Underlying the Indonesian Capital Goods Forecasts

2.1 General Framework

The objective is to provide forecasts of the demand for capital goods (the 61 categories of "engineering products" included in the published data for the SITC category 7). Demand is calculated as production plus imports minus exports. As such, it represents domestic demand only.

Ideally, these forecasts should be generated by comprehensive, consistent, and detailed models for each industry, which are then integrated into a model of the country. However, a model of this type capable of generating forecasts of the demand for capital goods at the level of detail desired in this study would have to be very large. Models of this type are rarely found, even in the major developed countries. For example, Informetrica, a private consulting firm in Ottawa, maintains a 5,000 equation model of the Canadian economy which, despite its large size, does not provide the detailed forecasts envisioned in this study. It is clear that, such as approach would be inappropriate. A much more practical approach, adopted here, is to attack the problem into two stages. In the first stage forecasts of major macroeconomic variables at a highly aggregated level are generated for the economy. In the second stage, detailed forecasts of demand for capital goods are based on the much less detailed forecasts of macroeconomic variables. Since the macroeconomic variables which are generated in the first stage must fit into the second stage, we will discuss the second stage first.

2.2 The Forecasts of the Demand for Capital Goods

2.2.1 The Conceptual Framework

Capital goods imports are of primary concern because there is very limited production of most capital goods in Indonesia. This fact has two implications.

The first is that possibilities for increased domestic production of capital goods (import substitution) should be of primary concern. This provides the basic orientation of this study. The second implication is much more practical; namely, that for many products imports can be viewed as identical to total demand. For products where there is production of capital goods and/or exports the commodity balance equation was used to generate the apparent demand. Thus, our forecasts can be interpreted as forecasts of demand for the capital goods considered in the study.

What, then, is the most appropriate method for forecasting the demand for specific capital goods in Indonesia? Some of the classifications are narrowly defined so that the capital goods can be identified with one particular sector; for example, pulp and paper machinery (SITC 718.1). Others are not specific to particular sectors, being broadly used throughout the economy, such as machine tools (SITC 715.1). Where possible, it would seem desirable to relate the demand for specific capital goods to economic variables relevant to the using sector or sectors. The major difficulty in this regard is the absence of readily available time series data on economic activity at a detailed sectoral level in Indonesia. Two input-output studies have been completed, but these provide two observations only. There are no time series data on the price of output by sector, on input prices by sector, or on investment or capital stock by sector, although some of these variables might be constructed from other available data. Thus the scarcity of relevant data is a significant constraint on the preparation of these forecasts.

A second important consideration is the nature of the choice of sectoral investments in these countries. In Indonesia the Government has a substantial impact on both the overall quantity and the sectoral pattern of investment. This impact may be direct through investment by public agencies, or indirect through licensing (control) of private investment through BKPM, or the allocation of loans to finance investment. The impact of Government on the decisions to use and import capital goods in Indonesia is more decisive than the impact of private decisions.

The above considerations rule out the use of a neo-classical framework which attempts to explain investment in terms of profitability. Considerations of profitability based on the prices faced by the private sector may not be appropirate if goverment decisions and plans are based on other criteria, such as the social opportunity costs of inputs or the externalities generated by the development of capital goods industries. The above argument may suggest a planning model framework, to explain government decisions; but, as indicated in the introduction to this chapter, the detailed application of that approach is beyond the scope of this project. Equally compelling factors in the decision not to follow either of the above approaches are the absence of the detailed time series data required to implement the neoclassical approach and the detailed structural data required to implement the planning approach.

The approach adopted makes use of the available time series data on capital goods imports, production and exports and sectoral value-added. Here demand for capital goods are related to changes in value-added in the appropriate capital-using sector or sectors.[1/] We interpret this procedure as the econometric estimation of incremental capital-output ratios where the capital goods are disaggregated in relatively great detail (the 61 available SITC categories) while the outputs are more highly aggregated (the 8 sectoral breakdown of GDP). This interpretation is strictly valid only if the ratio of value-added to the value of output remains constant over time.[2/] This may not be the case if other inputs are withdrawn from the using sector. In these circumstances we would not be able to estimate incremental capital-output ratios, which are based on the assumption of a fixed coefficient technology.

Some of the "engineering products" are clearly durable consumer goods, such as passenger motor cars (732.1) and therefore are excluded in this study.Other categories, such as ships and boats (735) or sewing machinery (717.3) may include both capital goods and/or consumer goods. For these products, a consumer demand equation may be an appropriate basis for forecasts. Such an equation has been used for these products, using the current level of GDP (in current Rupiah) as a proxy for consumer income.

Even for products which are clearly capital goods, the use of the current level of GDP as the basis for forecasts may be justified. GDP can be interpreted as representing the ability of a country to import. (This measure may be crude but the lack of data precludes more sophisticated measures). Under this interpretation the current level of GDP determines the level of imports of capital goods which in some cases represents the entire demand for a given capital goods, which in turn determines the changes of sectoral GDP in the future.

2.2.2 The forecasting equations

The forecasts of demand for specific capital goods were computed using an equation of one of the following forms:

$$(1)\ D_{it} = a_0 + a_1(GDP_{j,t+1} - GDP_{j,t}) + a_2(GDP_{j,t+2} - GDP_{j,t+1})$$

where D_{it} is the value of demand for capital goods i in period t and $GDP_{j,t}$ is the value-added in sector j in period t.[3/]
or

$$(2)\ D_{it} = a_0 + a_1\ GDP_t$$

where GDP_t is the current level of GDP.

Because some product categories are aggregates, such as construction and mining machinery (SITC 718.4), or include products which may be used in several sectors, such as pumps (SITC 719.2), the identification of the using sector cannot be based solely on a priori engineering judgement. For such products equations were estimated for each potential using sector.

The above equations were estimated using annual observations over the period 1967-1978. The estimation period could not be extended past 1978 as the GDP data must be available for two years after the end of the estimation period. The limited number of observations available made it impossible to introduce any longer lags between the demand for capital goods and changes in output. Each additional lag uses up two degrees of freedom, one for the additional parameter introduced and one for data point lost. Demand and GDP could be measured either in current or constant prices, since the demand data can be converted to constant prices using a price index for capital goods from the supplying countries and GDP data are available in both current and constant Rupiah. The results when current price data were used were superior to those obtained using constant data.[4/] Thus, it was decided to use current price values for all variables in the forecasting equations.[5/] The demand data were obtained from U.N. and domestic (BPS) sources, whereas the

GDP data were obtained from the U.N. Statistical Yearbook for the Far East and Asia. For capital goods U.S. dollar values were used, since the prices of these goods are primarily determined in supplying countries. GDP data was measured in domestic currency (Rupiahs), since this most accurately reflects changes in domestic activity. Several major devaluations over the data period have altered the US dollar/Rupiah conversion, so that changes in GDP measured in US dollars do not reflect changes in domestic activity.

There are several reasons why the relationships measured by the above equations might change over time, leading to errors in the forecasts. Firstly, the nature of technology may change so that the same sector uses a different mix of capital goods. Secondly, the mix of industries within a sector may change over time, having the same result. Finally, the price of the capital good may change relative to the price of output of the using sector. These potential biases in the forecasts are difficult to evaluate because we have no historical data describing the relationships in question.

The forecasting equations are described in Table II.1. Coefficient estimates, R^2 values, and Durbin-Watson statistics (D.W.) are presented and the using sector or sectors are identified. (The sectoral numbering scheme is described in Appendix Table 1.) These equations will be discussed in the following section.[6/]

Table II.1: The forecasting equations

Products	Coefficient Estimates (a_0)	(a_1)	(a_2)	D.W.	R^2	GDP Components
Total Engineering Products 7	231.813	0.001538	.002433	1.83	.78	GDP3
Total Machinery non-electric 71	93.9861	.000761	.001096	1.81	.76	GDP3
Total Electrical Machinery 72	91.9756	.0000199	-	.68	.76	GDP (current level)
Power Generating Machinery 711	31.5118	.0001307	.0001949	2.0	.64	GDP3
Boiler, Steam Generating Machinery 711.1	-2.96117	.0000019	-	2.55	.90	GDP (current level)
Steam Engines 711.3	1.60648	.000027	-.0000036	2.44	.41	GDP3
Aircraft Engines 711.4	.301452	.00000022	-	1.23	.34	GDP (current level)
Other Internal Combustion Engines 711.5	-3.82251	.0000097	-	1.08	.77	GDP (current level)
Nuclear Reactors 711.7	.763494	.000157	-	2.44	.76	GDP4
Engines, nes 711.8	-47.4401	.000289	-.0000271	2.47	.71	GDP3
* Agricultural Machinery 712	11.8243	.00000113	-	1.45	.16	GDP (current level)
Office Machinery 714	3.37534	.00000091	-	1.19	.90	GDP (current level)
Typewriters 714.1	1.12701	.000000327	-	2.23	.93	GDP (current level)

Table II.1 (continued)

Products	(a_0)	(a_1)	(a_2)	D.W.	R^2	GDP Components
Office Machines, nes 714.9	1.71982	.000000102	-	.99	.71	GDP3
Metal Working Machinery 715	2.59641	.0000676	-.00000247	2.10	.76	GDP3
Machine Tools 715.1	.147325	.0000595	-.00000416	2.95	.51	GDP3
Textile and Leather Machinery 717	24.5762	.00008638	.00009937	1.46	.70	GDP3
Textile Machinery 717.1	-3.27485	.000291	-.00000326	1.00	.75	GDP3
Skin, Leather Working Machinery 717.2	-.688028	.000000105	-	3.34	.98	GDP (current level)
Sewing Machinery 717.3	1.15705	.00000068	-	1.36	.95	GDP (current level)
Special Industrial Machinery 718	19.9178	.0001623	.0001853	1.74	.75	GDP3
Paper and Pulp Machinery 718.1	-3.12895	.00000063	-	1.58	.86	GDP (current level)
Food Processing Machinery 718.3	4.98328	.0000159	.0000127	1.10	.43	GDP3
Construction, Mining Machinery 718.4	13.7734	.000005135	-	1.20	.89	GDP (current level)
Mineral and Glass Working Machinery 718.5	4.54722	.0000557	-	1.63	.51	GDP3
Other Special Machinery 719	11.8940	.0003296	.0005347	1.75	.79	GDP3

Table II.1 (continued)

Products	(a_0)	(a_1)	(a_2)	D.W.	R^2	GDP Components
Heating, Cooling Equipment 719.1	3.88216	.0000528	.0000957	1.91	.70	GDP3
Pumps and Centrifuges 719.2	5.65528	.00006265	.0000876	1.50	.79	GDP3
Mechanical Handling Equipment 719.3	-1.59283	.0000605	.0000902	1.40	.78	GDP3
Powered Tools, Other 719.5	11.6129	.0000407	-.0000132	1.82	.72	GDP5
Spraying, Vending Other Machinery 719.6	1.64850	.0000256	.000028	1.42	.85	GDP5
Ball, Roller Bearings 719.7	1.45242	.0000003	-	3.17	.93	GDP (current level)
Machinery and Mechanical Appliances, nes 719.8	16.1207	.0000348	.0000954	1.77	.85	GDP3
Parts and Accessories of Machinery, nes 719.9	-9.85155	.0000634	.0001039	1.71	.68	GDP3
Electrical Power Machinery 722	13.1268	.000007338	-	.72	.85	GDP (current level)
Power Transforming Machinery 722.1	18.2241	.00000564	-	.64	.79	GDP (current level)
Switchgear, etc. 722.2	1.33627	.00000192	-	.95	.85	GDP (current level)
Equipment for Distributing Electricity 723	11.3279	.00000353	-	.72	.86	GDP (current level)

Table II.1 (continued)

Products	(a_0)	(a_1)	(a_2)	D.W.	R^2	GDP Components
Insulated Wire and Cable 723.1	11.9265	.0000031	-	.70	.84	GDP (current level)
Electric Insulated Equipment 723.2	-3.90489	.000000695	-	2.56	.88	GDP (current level)
Electrical Machinery Other 729	18.6848	.00000442	-	1.49	.77	GDP (current level)
Batteries and Accumulators 729.1	10.9191	.00000169	-	1.26	.95	GDP (current level)
Electric Lamps 729.2	-.398094	.000000497	-	1.29	.91	GDP (current level)
Valves, Tubes, etc. 729.3	-3.4687	.000000606	-	1.71	.81	GDP (current level)
Automotive Electrical Equipment 729.4	1.15065	-.00000332	.0000434	1.79	.78	GDP6
Measuring Apparatus 729.5	-22.0655	.000134	-.0000152	3.20	.49	GDP3
Electro-Mechanical Hand Tools 729.6	-.812592	.00000911	-	2.62	.60	GDP3
Other Electrical, nes 729.9	-1.92848	.0000507	.0000715	2.10	.94	GDP5
Railway Vehicles 731	-1.27096	.000095	.0000475	.92	.59	GDP6
Locomotives, Other 731.3	-1.32654	.0000095	.000035	1.87	.70	GDP6
Passenger: Railway, Tramway Cars 731.5	.581687	.0001777	-.0000776	1.45	.61	GDP6

Table II.1 (continued)

Products	(a_0)	(a_1)	(a_2)	D.W.	R^2	GDP Components
* Railway, Locomotive Car Parts, next 731.7	2.12409	.0000038	-	1.90	.11	GDP6
* Buses 732.2	15.7461	.00002	-	2.06	.05	GDP6
Lorries and Trucks 732.3	-40.4429	.000446	.000878	1.25	.85	GDP6
Special Purpose Lorries, Trucks and Vans 732.4	2.78519	.000000729	-	1.81	.51	GDP (current level)
* Tractors for Trailers 732.5	10.8994	-.00006694	.00005416	1.00	.25	GDP6
Ships and Boats 735	.995856	.0001677	.000149	1.78	.74	GDP6
Ships and Boats non-war 735.3	-.520072	.0000465	.0000176	1.85	.52	GDP6
Ships and Boats nes 735.9	.0308921	.000145	.0001214	1.82	.65	GDP6

Source: Econometric Research Ltd.

Note: No forecasts were generated for products marked with an *, since the statistical fit of the forecasting equations is poor.

2.3 The Forecasts of Sectoral GDP

2.3.1 The General Framework

In order to use the forecasting equations described in the previous section, forecasts of GDP by sector must be generated. These could potentially be generated with a medium scale econometric model (50-100 equations would be necessary). However, generation of such a model is a major undertaking, particularly when the data required are not readily available. Thus econometric models were not used for this purpose. Instead, time series extrapolations were used.

The time series procedure was broken down into steps. In the first step forecasts were generated for oil and non-oil GDP, taking into account the impact of oil revenues on both components of GDP. Three alternative forecasts, based on alternative assumptions about future oil revenues were generated. (These forecasts are denoted High, Medium and Low.) In the second step, sectoral shares of non-oil GDP were forecast, again based on time series extrapolations. The third and final step was the multiplication of non-oil sectoral shares by the forecast of non-oil GDP in order to obtain forecasts of non-oil sectoral GDP levels.

The short time series precluded any more sophisticated time series procedures.

2.3.2 The GDP Forecasts

It might be argued that relatively simple econometric models could have been used to generate these forecasts. However, these results would be sensitive to forecasts of exogenous variables, particularly the price of oil or oil revenues. Here we relate GDP directly to oil prices, in order to make this dependence explicit.

The historical growth rates of oil, non-oil and total GDP (in current Rupiahs) together with the forecasting equations are presented in Table II.2. In contrast to other OPEC countries, the impact of oil revenues on non-oil GDP has been relatively small (the estimated elasticity is only 0.04).[7/] The impact of oil revenues on oil-GDP is predictably high (the estimated elasticity is 0.94). After the impact of oil revenues is taken into account, the trend growth rate of non-oil GDP was 22.7 per cent (in current Rupiah).

Table II.2 Historical growth rates and forecasting equations for oil, and total GDP

A. Historical Growth rates: a/ b/

GDP	Time Period	Growth rate
Oil	1967-1980	43.87
Non-oil	1967-1980	24.87
Total	1967-1980	27.00

B. Forecasting Equations: c/

LN(Oil-GDP) = Ln(a)+b Ln(Oil-Revenue)
LN(Non-oil GDP) = Ln(c)+d Ln(Oil Revenue)+f time

Total GDP = Oil GDP + Non-oil GDP

Coefficient Estimates:

Coefficient	Estimated Coefficient	Standard Error	T Statistic
a	3.17642	1.74860	1.81655
b	0.944862	0.0416108	22.7071
c	681502.0	598649.	1.13840
d	0.0395049	0.0892481	0.442642
f	0.227837	0.0403213	5.65053

Notes: a/ Growth rates were determined from econometric estimates of the following equation:
$\ln X_t = a + bt + \varepsilon_t$
where b is the estimated annual growth rate.
b/ All values are in Current Rupiah.
c/ The above equations were estimated as a system using the full-information maximum likelihood method.

In order to use the above equation systems, forecasts of oil revenues must be made. The period of the 1970's saw rapid increases in oil revenues in Indonesia. However, the early 1980's have been characterised by falling demand for oil and falling oil prices. The basic assumption made here is that the world oil market will recover by 1985, as the world economy recovers from the severe recession which began in 1981, and continue to expand thereafter. Three assumptions are made about the rate of expansion after 1985, leading to the "High", "Medium" and "Low" growth scenarios. Oil production (in million barrels per day) was forecast to increase from a level of 1.34 in 1983 to 1.65

in 1985, 1.90 in 1990 and 2.0 in 2000. (These production forecasts are consistent with World Bank forecasts.) Three alternative assumptions were made concerning oil prices. In the "Low" scenario the oil price was held constant at \$ 28 (US per barrel) for the entire forecasting period. In the "Medium" scenario the oil price rises to \$ 34 in 1987 and continues to increase at 2 per cent until 2000. In the "High" scenario (based on World Bank forecasts) the oil price is \$ 32 in 1985, \$ 52 in 1990 and \$ 75 in 2000.

The above assumptions concerning oil revenues may appear to be somewhat arbitrary, but they are based on the best judgements of Econometric Research. When the forecast oil revenues are substituted into the forecasting equations in Table II.2, forecasts of Oil GDP, Non-oil GDP and Total GDP (in millions of Rupiah) are generated. (see Appendix)

2.4 Forecasts of Non-oil Sectoral GDP

The forecasts of non-oil sectoral GDP were based on forecast shares of non-oil GDP. Two sets of share forecasts were generated. The first set was based on an extrapolation of historical data and thus is referred to as the "Trend" (or T) forecasts. The second set of share forecasts modified the trend forecasts to take account of official development plans for increased growth of the manufacturing sector. This set of share forecasts is referred to as the "Off-trend" (or O) forecasts.

The trend share forecasts were based on a system of logistic equations whose parameters were estimated from time series data (the estimation periods are the same as those shown in Table II.2). The system of equations is given below:

$$(3)\quad \left[\begin{array}{ll} S_{jT} = A_j / (1+B_j \mathrm{EXP}(-C_j * T)) & j = 1, \ldots, 6 \\ S_{7T} = 1 - \sum_{j=1}^{6} S_{jT} & \end{array}\right.$$

where S_{jT} is the share of non-oil GDP generated in sector j in year T. Formulating the final share as a residual forces the fitted values for the shares to sum to one, as well as forcing the forecast shares to sum to one.

Oil GDP is forecast separately so that only non-oil GDP was allocated to sectors using the above system. The above equation system was estimated by full information maximum likelihood, using the FIML procedure in the TSP econometrics package. This method produced reasonable share forecasts. The coefficient estimates are presented in Table II.3.[8/]

Table II.3 Estimates of the non-oil GDP share equations

	Estimated Coefficient	Standard Error	T Statistic	D.W.
Agriculture:S1				
a1	1.45594	3.90285	0.373045	2.27
b1	1.50021	6.59162	0.227594	
c1	0.0554643	0.0677187	0.819040	
Manufacturing:S2				
a2	0.116087	0.0021028	55.2041	2.26
b2	0.740302	0.129859	5.70081	
c2	-0.397212	0.0848223	-4.68288	
Electricity:S3				
a3	0.00738778	0.00107177	6.89308	1.69
b3	1.01474	0.278164	3.64801	
c3	-0.206212	0.128080	-1.61003	
Construction:S4				
a4	0.0928245	0.00916033	10.1333	1.73
b4	4.58040	0.463740	9.87708	
c4	-0.223693	0.0328150	-6.81679	
Transportation:S5				
a5	0.0542478	0.00285832	18.9789	2.74
b5	2.43425	0.941303	2.58604	
c5	-0.442732	0.139033	-3.18437	
Wholesale + Retail Trade:S6				
a6	0.197761	0.00378765	52.212	1.59
b6	0.209263	0.147611	1.41767	
c6	-0.510215	0.442427	-1.15322	

Source: Econometric Research Ltd.

Note: The coefficients a1, b1, etc. correspond to aj, bj, etc. in equation (3).

In order to produce the "Off-trend" (or O) share forecasts, the manufacturing and agriculture shares of GDP were forecast separately.[9/] The trend shares for each of the other sectors were then reduced by the same proportion, in order that the sum of all sectoral shares equals one. The trend and off trend shares for manufacturing are reported (for 1985, 1990 and 2000) in Table II.4.

Table II.4: Forecasts of sectoral GDP shares, Indonesia

(Percentage of non-oil GDP)

A: Off-trend forecast

YEAR	SHARE1	SHARE2	SHARE3	SHARE4	SHARE5	SHARE6	SHARE7
				LOW			
1980	.340092000	.11984300	.006759950	.07700260	.053731300	.196314000	.205570000
1985	.259552000	.13202000	.007110790	.08555760	.053238400	.194183000	.258327000
1990	.210054000	.14823100	.007358220	.08757580	.052271500	.190567000	.304219000
1995	.159852000	.17655000	.006354550	.08587270	.050534800	.184226000	.335240000
2000	.118340000	.21753700	.005532540	.08196710	.048011800	.175527000	.352424000
				MEDIUM			
1980	.340092000	.11984300	.006759950	.07700260	.053731300	.196314000	.205570000
1985	.265901000	.13414800	.007093350	.08534790	.053107900	.193707000	.257694000
1990	.209409000	.15089600	.007046200	.08730600	.052108800	.189974000	.303272000
1995	.159392000	.17808700	.006352110	.08571720	.050443200	.183392000	.335530000
2000	.118222000	.21848100	.005525990	.08188490	.047963500	.174852000	.352071000
				HIGH			
1980	.340092000	.11984300	.006759950	.07700260	.053731300	.196314000	.205570000
1985	.260685000	.13484600	.007087540	.08527910	.053065100	.193531000	.257486000
1990	.208135000	.15805200	.007003320	.08677470	.051791700	.188518000	.301426000
1995	.158743000	.18142000	.006324200	.08536500	.050237000	.183143000	.334263000
2000	.117928000	.22042100	.005509790	.08166170	.047844600	.174418000	.351197000

B: Trend forecast

1980	.341671000	.11575800	.006792250	.07736000	.053980700	.197728000	.205811000
1985	.274525000	.11604200	.007261590	.08713260	.054210500	.197755000	.265093000
1990	.217932000	.11605100	.007325910	.09053440	.054244600	.197760000	.315702000
1995	.171413000	.11603700	.007368870	.09218150	.054247500	.197761000	.353942000
2000	.133711000	.11603700	.007381020	.09261340	.054247000	.197761000	.378199000

Source: Econometric Research Ltd.

Six sets of sectoral GDP forecasts were produced. Combination of the trend and off-trend shares with the high GDP level forecasts gives the high trend (H-T) and high off-trend (H-O) sectoral GDP forecasts, while combination of these forecast shares with the medium and low GDP level forecasts gives the medium and low trend (M-T and L-T) and medium and low off-trend (M-O and L-O) sectoral GDP forecasts. These forecasts are presented in the Appendixes 3 and 4.

2.5 Conversion of Demand Forecasts to Constant 1980 US Dollars

The insertion of the forecast levels of GDP and changes in sectoral GDP into the forecasting equations (1) and (2) produces forecasts of the demands for capital goods in current US dollars. However, in order to examine the size of the Indonesian market for capital goods, it is necessary to convert these forecasts into constant dollar terms. Forecasts of a price deflator for capital goods are required for this conversion.

Capital goods in Indonesia are imported mainly from developed countries such as Japan, those in Western Europe and North America. Ideally, a weighted average of capital goods price indexes from these supplying countries should be used as a basis for forecasting the price deflator for capital goods in Indonesia. However, such indexes are readily available for only a few countries. Thus data from the U.S. were used (Data from Canada produced very similar results). The period of the 1970's has demonstrated clearly the impact of oil prices on the prices of all products in the developing countries. The following equation was estimated using U.S. data for the period 1972-82.

$$(4) \qquad L_n PE_t = \underset{(83.3)}{3.52} + \underset{(6.94)}{0.0575\, t} + \underset{(2.33)}{0.0765 \text{ Ln } PO_{t-1}}$$

$$R^2 = 0.988 \qquad D.W. = 1.41$$

where PE_t is the price index for equipment in period t (1980 = 100) and PO_{t-1} is the price index of oil lagged one period (1980 = 100). The coefficient of the oil price in the above equation is statistically significant (at the 5 per cent level in a one-tail test), indicating a measurable relationship between the lagged oil-price and the capital goods price. The above equation was used to generate forecasts of the price index for equipment, using the same assumptions about oil prices used in generating the "Low", "Medium" and "High" forecasts of oil revenues. Thus three forecasts of the price deflator for capital goods were generated. The annual rates of growth of capital goods prices between 1980 and 2000 which are implied by these three forecasts are 7.24, 7.34 and 7.61 per cent.

Chapter III. Indonesian Future Demand for Capital Goods. The Results of the Forecasting Exercise

3.1 The Background

Simple forecasting exercises usually involve the use of mechanical trend extrapolation for some variables of interest. Such a simple procedure may be useful in the case of some limited subset of problems where accuracy and explanation are not essential or where the growth process of the underlying phenomena is strongly stable.

These conditions are certainly inapplicable to the case of the demand for capital goods in Indonesia, both because the underlying phenomena is not stable and because explanation of behaviour is very essential given your interest in policy prescriptions.

Thus, a more refined approach is employed here. We begin by postulating a set of hypotheses about the demand for capital goods relationship and proceed to test them empirically as was described above. The assignment of specific capital goods to sectors employed engineering and other technical data, whereas the set of explanatory variables chosen, their signs and the structure of the equation were modelled along the *a priori* restrictions of economic theory.

Three target years were chosen to represent the short-run (1985), the medium-run (1990) and the long-run (2000). The actual demand values in 1980 are also presented to provide a bench-mark against which the forecasts may be checked. For each forecast alternative (trend and off-trend) we present a special table which displays the forecast values of demand for low, medium and high GDP scenarios. Although we presented the demand forecasts in both current and constant dollars, only the latter was analysed.

3.2 The Historical Trend Forecasts

History enters our system through its influence on the structure of production. The historical trend forecasts represent the projection of past logistical curves into the future. Logistic curves were used to prevent the share of any one sector from becoming too large. The historical shares and their historical trend projections are presented in the Appendixes 2 and 3. Coupling these forecasts of sectoral shares with our forecasts of GDP growth rates under alternative hypotheses of oil and LNG revenues results in the projected demands for the various capital goods presented in Table III.1 for the constant dollar forecasts and Table III.2 for the current dollar forecasts. The corresponding growth rates for constant dollar trend forecast are indicated in Appendix 8.

The analysis of the results is divided into the short-run (1985), the medium-term (1990) and the long-term (2000). We begin first with the short-run forecasts.

3.2.1 The Short-term Forecasts (1985)

Total demand for non-electrical machinery in Indonesia was $ 1,948 billion om 1980. In 1985, the lowest forecast, is for $ 3,628 billion in constant 1980 dollars, whereas the highest forecast is for $ 3,787 billion. Thus, demand for non-electrical machinery is expected to double over the five year period between 1980 and 1985.

Special industrial machinery, particularly construction and mining machinery, other special machinery, electric machinery, and transport equipment represent the major components of the forecast demand for capital goods in Indonesia in 1985.

Demand for paper and pulp machinery is slated to rise from $ 21 million in 1980 to over $ 38.8 million under the medium forcast in 1985. This represents a 13.8 per cent annual rate of growth. Demand for food processing machinery is projected to increase at about twice the rate of growth of pulp and paper machinery or at 25.7 per cent. On the other hand, construction and mining

Table III.1: TREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS

INDONESIA

(MILLIONS OF CONSTANT 1990 U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
TOTAL ENGINEERING PRODUCTS (7)	3357.	7957.2	8221.2	8312.0	17149.8	17915.0	18208.3	37394.7	40092.6	40610.0	81829.7	89641.4	90975.1
TOTAL MACHINERY NON-ELECTRIC (71)	1948.	3627.9	3748.2	3756.8	7817.7	8212.9	8304.5	17045.3	18275.0	18520.9	37238.5	40859.4	41490.1
POWER GENERATING MACHINERY (711)	425.	639.1	660.2	657.5	1360.5	1427.5	1446.4	2354.4	3167.6	3213.4	6456.5	7073.1	7189.7
BOILER,STEAM GENERATING MACHINERY (711.1)	156.	116.0	120.7	121.2	232.3	247.1	256.6	485.5	522.7	535.5	1048.1	1147.3	1167.0
STEAM ENGINES (711.3)	3.	36.5	37.7	37.9	78.3	82.1	82.9	170.3	182.4	184.5	372.3	407.6	412.9
AIR CRAFT ENGINES (711.4)	11.	13.3	14.4	14.5	27.2	29.9	30.0	56.4	60.7	62.2	121.5	132.9	135.2
OTHER INTERNAL COMBUSTION ENGINES (711.5)	34.	58.2	60.5	60.8	119.5	126.1	131.0	249.2	268.3	274.9	539.0	590.0	600.2
NUCLEAR REACTORS (711.7)	6.	16.1	16.5	16.8	34.5	36.2	36.6	75.1	80.5	81.4	164.3	173.9	182.3
ENGINES,NES (711.8)	38.	368.2	380.4	383.8	852.3	894.2	903.6	1899.8	2035.3	2059.6	4195.8	4582.3	4644.0
AGRICULTURAL MACHINERY (712)	36.	79.0	82.3	82.3	146.4	155.5	161.2	297.1	319.7	327.4	634.8	694.8	706.7
OFFICE MACHINERY (714)	40.	59.5	61.9	62.0	114.3	122.1	126.7	236.9	255.0	261.2	509.1	557.3	566.8
TYPEWRITERS (714.1)	12.	21.3	22.1	22.2	41.2	43.7	45.4	84.9	91.4	93.6	182.6	199.8	203.3
OFFICE MACHINES,NES (714.3)	8.	7.5	7.8	7.9	13.5	14.3	14.8	27.0	29.1	29.7	57.4	62.8	63.9
METAL WORKING MACHINERY (715)	49.	102.9	106.1	106.9	222.2	233.0	235.4	484.8	519.5	525.5	1061.1	1161.7	1177.2
MACHINE TOOLS (715.1)	36.	85.1	87.9	88.5	186.0	195.0	197.0	407.2	436.3	441.3	892.1	976.7	989.7
TEXTILE MACHINERY (717.1)	170.	447.4	461.3	465.7	981.7	1029.6	1040.2	2152.2	2306.4	2333.0	4717.4	5165.3	5234.2

Table III.1: TREND FORECAST OF THE DEMAND FOR CAPITAL GOODS
(continued)

INDONESIA

(MILLIONS OF CONSTANT 1990 U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
SKIN,LEATHER WORKING MACHINERY (717.2)	3.	6.2	6.4	5.4	12.8	13.6	14.1	27.0	29.1	29.8	58.6	64.1	65.2
SEWING MACHINERY (717.3)	31.	43.5	45.2	45.3	85.1	90.5	93.9	176.4	189.8	194.5	379.7	415.6	422.7
SPECIAL INDUSTRIAL MACHINERY (718)	325.	667.6	589.5	595.1	1435.4	1516.0	1523.2	3127.3	3352.8	3394.7	5841.5	7494.4	7602.8
PAPER AND PULP MACHINERY (718.1)	21.	37.3	38.9	39.0	76.5	81.4	84.6	161.2	173.6	177.9	349.1	382.1	388.7
PRINTING MACHINERY (718.2)	27.	49.9	50.5	33.9	104.6	119.7	110.8	227.4	243.7	246.4	497.0	544.2	551.4
FOOD PROCESSING MACHINERY (718.3)	19.	57.6	59.5	59.9	121.1	127.1	128.1	261.9	280.7	283.3	571.5	625.9	632.9
CONSTRUCTION,MINING MACHINERY (718.4)	220.	331.5	344.5	345.7	644.6	635.3	711.2	1332.9	1434.8	1469.7	2867.0	3138.2	3192.0
MINERAL AND GLASS WORKING MACHINERY (718.5)	38.	73.5	75.3	76.3	151.9	159.2	160.5	326.1	349.4	353.0	710.0	777.4	786.9
OTHER SPECIAL MACHINERY (718)	968.	1692.8	1749.2	1757.8	3681.9	3351.6	3912.5	9052.2	9633.4	8751.4	17637.2	19321.4	19623.1
HEATING,COOLING EQUIPMENT (719.1)	171.	294.3	304.1	317.6	539.4	659.9	678.9	1394.9	1495.6	1517.2	3054.4	3346.1	3401.1
PUMPS AND CENTRIFUGES (719.2)	124.	299.1	309.1	311.8	548.3	590.2	687.6	1416.1	1518.2	1536.3	3100.5	3396.4	3443.4
MECHANICAL HANDLING EQUIP (719.3)	124.	293.5	303.4	306.4	642.7	574.4	692.4	1408.4	1510.1	1529.6	3097.0	3381.7	3431.9
POWERED-TOOLS,OTHER (719.5)	53.	37.7	38.9	39.0	71.4	74.7	75.3	148.3	158.8	160.4	319.3	349.4	353.7
SPRAYING,VENDING, OTHER MACHINERY (719.6)	29.	76.6	79.1	79.6	166.4	174.6	175.9	363.4	389.6	393.1	795.7	871.6	881.0
BALL,ROLLER BEARINGS (719.7)	19.	19.6	20.4	20.5	37.6	40.0	41.5	77.4	83.3	85.3	166.1	181.8	184.9
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	143.	280.2	289.4	292.4	597.1	626.5	634.4	1297.2	1390.8	1409.9	2835.2	3106.0	3155.0
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	201.	308.3	318.7	322.8	679.9	713.5	724.2	1493.6	1601.5	1626.9	3276.1	3583.1	3653.2

Table III.1: (continued)

TREND FORECAST OF THE DEMAND FOR CAPITAL GOODS

INDONESIA

(MILLIONS OF CONSTANT 1980 U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
TOTAL ELECTRICAL MACHINERY (72)	82.	1309.6	1360.7	1365.2	2514.9	2673.2	2773.1	5175.5	5570.6	5705.8	11113.5	12164.4	12372.9
ELECTRICAL POWER MACHINERY (722)	237.	469.3	487.3	433.6	318.1	376.2	1013.2	1902.7	2048.1	2098.1	4095.5	4482.9	4559.9
POWER TRANSFORMING MACHINERY (722.1)	224.	366.1	380.5	331.8	709.5	734.3	782.7	1465.1	1577.1	1615.4	3149.9	3447.8	3506.9
SWITCH GEAR, ETC. (722.2)	73.	121.2	126.0	126.5	238.9	234.0	263.7	496.4	534.4	547.4	1369.5	1170.7	1190.8
EQUIPMENT FOR DISTRIBUTIN ELECTRICITY (723)	158.	229.3	238.3	233.1	444.4	472.4	490.2	917.7	987.8	1011.8	1973.0	2153.6	2196.6
INSULATED WIRE AND CABLE (723.1)	135.	201.3	209.3	210.6	389.7	414.3	429.8	803.5	864.9	885.9	1726.6	1883.8	1922.2
ELECTRIC INSULATED EQUIPMENT (723.2)	24.	41.0	42.7	42.9	84.5	30.0	93.5	178.5	192.2	197.0	386.7	423.3	430.6
ELECTRICAL MACHINERY OTHER (729)	141.	289.6	300.3	311.9	537.5	532.6	614.8	1148.3	1236.0	1266.0	2466.7	2699.9	2746.2
BATTERIES AND ACCUMULATORS (729.1)	81.	113.1	117.5	117.9	214.7	228.2	236.7	440.0	473.5	485.0	743.3	1032.4	1050.1
ELECTRIC LAMPS (729.2)	18.	30.3	32.2	32.3	61.6	55.5	68.0	128.4	138.3	141.6	277.1	303.3	308.5
VALVES, TUBES, ETC. (729.3)	15.	35.7	37.2	37.3	73.7	78.4	81.5	155.6	167.5	171.6	337.0	368.9	375.3
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	25.	38.3	39.5	40.0	82.5	96.6	87.6	179.9	192.9	195.3	333.7	431.4	437.6
MEASURING APPARATUS (729.5)	29.	164.6	170.1	171.6	382.0	410.7	404.9	851.9	913.0	923.5	1877.4	2055.5	2082.8
ELECTRO-MECHANICAL HAND TOOLS (729.6)	6.	13.7	14.2	14.3	30.9	32.3	32.7	68.1	73.0	73.8	149.6	163.8	166.0
OTHERS, NES (729.9)	57.	172.6	178.3	179.5	380.1	338.9	402.4	834.2	894.4	903.0	1829.0	2003.7	2026.9
TOTAL TRANSPORT EQUIPMENT (73)	1227.	2800.9	2394.7	2321.3	6115.4	6417.7	6488.1	13391.8	14359.1	14529.6	29345.1	32148.7	32592.6
RAILWAY VEHICLES (731)	236.	112.4	116.1	117.1	246.8	238.9	261.7	541.3	580.3	587.2	1186.8	1299.9	1317.7

Table III.1: TREND FORECAST OF THE DEMAND FOR CAPITAL GOODS
(continued) INDONESIA
(MILLIONS OF CONSTANT 1980 U.S. DOLLARS)

	1980	1985			1990			1995			2000		
PRODUCTS	ACTUAL VALUES	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH
LOCOMOTIVES, OTHER (731.3)	6.	38.2	39.5	40.9	84.7	86.3	89.9	186.4	193.9	202.4	409.2	448.3	454.7
PASSENGERS, RAILWAY, TRAMWAY CARS (731.5)	12.	59.1	60.3	61.2	128.9	135.1	136.2	291.9	301.8	304.9	617.3	675.2	683.5
RAILWAY, LOCOMOTIVE CAR PARTS, NES (731.7)	2.	4.3	5.1	5.1	8.6	9.0	9.1	17.4	18.6	18.8	37.1	40.6	41.2
BUSES (732.2)	31.	28.3	29.7	30.9	47.5	49.7	50.2	93.1	93.7	100.8	196.2	214.9	217.9
LORRIES AND TRUCKS (732.3)	186.	1039.4	1136.7	1149.0	2441.2	2562.2	2591.9	5374.6	5763.2	5834.5	11797.5	12925.1	13109.4
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	33.	47.6	49.4	49.6	91.8	97.6	101.3	189.4	203.9	208.8	407.0	445.4	453.1
TRACTORS FOR TR-TRAILERS (732.5)	12.	8.1	8.4	8.5	6.8	7.1	7.3	7.3	8.0	8.2	10.7	12.1	12.7
SHIPS AND BOATS (735)	35.	259.1	267.9	269.6	565.2	593.1	598.2	1237.3	1326.5	1339.1	2710.8	2963.5	3003.3
SHIPS AND BOATS NON-WAR (735.3)	16.	49.3	51.5	52.0	109.5	114.9	116.1	240.2	257.4	260.5	526.5	576.6	584.5
SHIPS AND BOATS NES (735.3)	17.	72.2	74.6	75.4	147.6	155.0	156.8	316.4	339.4	343.7	688.5	754.8	766.1

SOURCE: ECONOMETRIC RESEARCH LTD.

Note: The growth rates corresponding to the trend forecast in this table (based on constant 1980 US dollars) are contained in Appendix 8.

Table III.2: TREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS

INDONESIA

(MILLIONS OF CURRENT U.S. DOLLARS)

PRODUCTS	1980	1985			1990			1995			2000		
	ACTUAL VALUES	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	3357.	11926.	12087.	12241.	36623.	37148.	37994.	113780.	115877.	119174.	354750.	362735.	374881.
TOTAL MACHINERY NON-ELECTRIC (71)	1948.	5437.	5511.	5583.	16695.	16334.	17329.	51863.	52819.	54351.	161700.	165338.	170968.
POWER GENERATING MACHINERY (711)	425.	958.	971.	984.	2905.	2947.	3018.	8989.	9155.	9430.	27991.	28621.	29627.
BOILER,STEAM GENERATING MACHINERY (711.1)	156.	174.	178.	179.	496.	510.	536.	1477.	1511.	1572.	4544.	4643.	4809.
STEAM ENGINES (711.3)	3.	55.	55.	56.	167.	169.	173.	518.	527.	541.	1614.	1649.	1702.
AIR CRAFT ENGINES (711.4)	11.	21.	21.	21.	58.	60.	63.	172.	176.	183.	527.	538.	557.
OTHER INTERNAL COMBUSTION ENGINES (711.5)	34.	97.	89.	90.	253.	260.	273.	758.	775.	807.	2337.	2397.	2473.
NUCLEAR REACTORS (711.7)	6.	24.	24.	25.	74.	75.	76.	229.	233.	239.	712.	728.	751.
ENGINES,NES (711.9)	39.	552.	559.	566.	1820.	1846.	1886.	5780.	5884.	6044.	19147.	18545.	19137.
AGRICULTURAL MACHINERY (712)	36.	118.	121.	121.	313.	321.	336.	904.	924.	961.	2752.	2812.	2912.
OFFICE MACHINERY (714)	40.	89.	91.	91.	245.	252.	264.	721.	737.	767.	2207.	2255.	2336.
TYPEWRITERS (714.1)	12.	32.	33.	33.	88.	90.	95.	258.	264.	275.	792.	803.	838.
OFFICE MACHINES,NES (714.9)	8.	11.	12.	12.	29.	30.	31.	82.	84.	87.	249.	254.	263.
METAL WORKING MACHINERY (715)	49.	154.	156.	158.	475.	481.	491.	1475.	1502.	1542.	4608.	4701.	4851.
MACHINE TOOLS (715.1)	36.	129.	129.	131.	397.	403.	411.	1239.	1261.	1295.	3969.	3952.	4078.
TEXTILE MACHINERY (717.1)	170.	671.	679.	687.	2096.	2126.	2171.	5549.	6666.	5846.	20452.	20301.	21569.

Table III.2: TREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS
(continued)
INDONESIA
(MILLIONS OF CURRENT U.S. DOLLARS)

	1980	1985			1990			1995			2000		
PRODUCTS	ACTUAL VALUES	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH
SKIN,LEATHER WORKING MACHINERY (717.2)	3.	9.	9.	10.	27.	29.	30.	82.	84.	88.	254.	260.	269.
SEWING MACHINERY (717.3)	31.	65.	66.	57.	182.	187.	196.	537.	549.	571.	1645.	1692.	1742.
SPECIAL INDUSTRIAL MACHINERY (718)	325.	1001.	1014.	1126.	3065.	3109.	3179.	9515.	9690.	9962.	29660.	30326.	31329.
PAPER AND PULP MACHINERY (718.1)	21.	56.	57.	57.	163.	168.	177.	491.	502.	522.	1513.	1546.	1602.
PRINTING MACHINERY (718.2)	27.	73.	74.	75.	223.	227.	231.	692.	704.	723.	2155.	2202.	2272.
FOOD PROCESSING MACHINERY (718.3)	19.	86.	88.	99.	259.	262.	267.	797.	811.	831.	2477.	2533.	2608.
CONSTRUCTION,MINING MACHINERY (718.4)	220.	497.	507.	510.	1377.	1415.	1484.	4056.	4147.	4313.	12429.	12633.	13154.
MINERAL AND GLASS WORKING MACHINERY (718.5)	38.	110.	112.	113.	324.	329.	335.	992.	1010.	1036.	3079.	3146.	3243.
OTHER SPECIAL MACHINERY (718)	168.	2537.	2572.	2507.	7863.	7376.	9164.	24500.	24953.	25682.	76462.	78184.	80861.
HEATING,COOLING EQUIPMENT (719.1)	171.	441.	447.	454.	1363.	1383.	1417.	4244.	4323.	4452.	13242.	13540.	14015.
PUMPS AND CENTRIFUGES (719.2)	124.	448.	454.	460.	1384.	1404.	1435.	4309.	4388.	4508.	13441.	13744.	14189.
MECHANICAL HANDLING EQUIP (719.3)	124.	440.	446.	452.	1372.	1392.	1424.	4285.	4364.	4489.	13383.	13694.	14142.
POWERED-TOOLS,OTHER (719.5)	53.	57.	57.	59.	152.	154.	157.	451.	459.	471.	1384.	1414.	1458.
SPRAYING,VENDING, OTHER MACHINERY (719.6)	29.	115.	116.	117.	355.	360.	367.	1106.	1126.	1154.	3443.	3527.	3630.
BALL,ROLLER BEARINGS (719.7)	19.	29.	30.	30.	80.	83.	87.	235.	241.	250.	720.	736.	762.
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	143.	420.	426.	431.	1275.	1293.	1324.	3947.	4020.	4138.	12292.	12559.	13001.
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	291.	462.	469.	476.	1452.	1473.	1511.	4544.	4629.	4774.	14203.	14523.	15054.

Table III.2: (continued)

TREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS
INDONESIA
(MILLIONS OF CURRENT U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
TOTAL ELECTRICAL MACHINERY (72)	782.	1963.	2001.	2113.	5370.	5518.	5787.	13747.	16101.	16744.	48193.	49224.	50985.
ELECTRICAL POWER MACHINERY (722)	297.	703.	717.	722.	1961.	2115.	2114.	5789.	5920.	6157.	17759.	18140.	18790.
POWER TRANSFORMING MACHINERY (722.1)	224.	549.	560.	563.	1515.	1557.	1633.	4458.	4558.	4741.	13656.	13951.	14451.
SWITCH GEAR, ETC. (722.2)	73.	182.	185.	197.	510.	524.	550.	1510.	1544.	1607.	4637.	4737.	4907.
EQUIPMENT FOR DISTRIBUTIN ELECTRICITY (723)	158.	344.	350.	353.	949.	975.	1023.	2792.	2855.	2969.	8553.	8733.	9052.
INSULATED WIRE AND CABLE (723.1)	135.	303.	309.	310.	832.	855.	897.	2445.	2500.	2600.	7483.	7647.	7921.
ELECTRIC INSULATED EQUIPMENT (723.2)	24.	62.	63.	63.	181.	186.	195.	543.	556.	578.	1677.	1713.	1775.
ELECTRICAL MACHINERY OTHER (729)	141.	434.	442.	445.	1190.	1223.	1283.	3494.	3572.	3715.	10534.	10925.	11316.
BATTERIES AND ACCUMULATORS (729.1)	81.	170.	173.	174.	459.	471.	494.	1339.	1369.	1423.	4083.	4179.	4327.
ELECTRIC LAMPS (729.2)	18.	46.	47.	48.	132.	135.	142.	391.	400.	416.	1201.	1227.	1271.
VALVES, TUBES, ETC. (729.3)	15.	54.	55.	55.	157.	162.	170.	473.	484.	504.	1461.	1493.	1547.
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	25.	57.	58.	59.	176.	179.	183.	547.	558.	573.	1707.	1746.	1803.
MEASURING APPARATUS (729.5)	23.	247.	250.	253.	816.	827.	845.	2592.	2639.	2710.	8133.	8319.	8583.
ELECTRO-MECHANICAL HAND TOOLS (729.6)	6.	21.	21.	21.	66.	67.	69.	207.	211.	217.	649.	663.	684.
OTHERS, IES (729.9)	57.	259.	262.	265.	812.	823.	840.	2538.	2585.	2650.	7929.	8199.	8352.
TOTAL TRANSPORT EQUIPMENT (73)	1227.	4198.	4256.	4307.	13059.	13248.	13538.	40747.	41501.	42639.	127219.	130030.	134304.
RAILWAY VEHICLES (731)	296.	168.	171.	173.	527.	535.	546.	1647.	1677.	1723.	5145.	5260.	5430.

Table III.2: TREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS
(continued) INDONESIA

(MILLIONS OF CURRENT U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
LOCOMOTIVES, OTHER (731.3)	6.	57.	58.	59.	181.	184.	188.	567.	578.	594.	1774.	1814.	1874.
PASSENGERS, RAILWAY, TRAMWAY CARS (731.5)	12.	89.	90.	90.	275.	279.	284.	858.	872.	895.	2676.	2732.	2816.
RAILWAY, LOCOMOTIVE CAR PARTS, NES (731.7)	2.	7.	7.	9.	18.	13.	19.	53.	54.	55.	161.	164.	170.
BUSES (732.2)	31.	43.	44.	44.	101.	103.	105.	283.	288.	296.	951.	870.	898.
LORRIES AND TRUCKS (732.3)	186.	1648.	1671.	1693.	5213.	5299.	5408.	16353.	16657.	17122.	51145.	52302.	54020.
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	33.	71.	73.	73.	196.	202.	211.	576.	589.	613.	1764.	1803.	1867.
TRACTORS FOR TRAILERS (732.5)	12.	12.	12.	13.	15.	15.	15.	22.	23.	24.	47.	43.	53.
SHIPS AND BOATS (735)	35.	388.	394.	398.	1207.	1224.	1248.	3765.	3834.	3930.	11752.	12016.	12376.
SHIPS AND BOATS NON-WAR (735.3)	16.	75.	76.	77.	234.	237.	242.	731.	744.	764.	2283.	2333.	2409.
SHIPS AND BOATS NES (735.9)	17.	108.	110.	111.	315.	320.	327.	963.	981.	1009.	2985.	3055.	3157.

SOURCE: ECONOMETRIC RESEARCH LTD.

machinery demand is expected to grow at the relatively low rate of growth of 9.4 per cent during the same period.

In short, despite low rates of growth of the economy at large the demand for machinery, even under the lowest growth scenario, is expected to grow at high rates and the dollar volume is, by any standards, substantial.

3.2.2 The Medium-Term Forecasts (1990)

The medium-term forecast is more optimistic for the economy and for the capital goods sector than that of the short-term. Both oil prices and GDP are expected to display vigorous growth and this is automatically reflected in the demand for capital goods forecast.

The total demand for non-electrical machinery in Indonesia is forecast to reach $ 8.2 billion under the medium forecast conditions in 1990. This represents over a four-fold increase over the 1980 actual demand. Not surprisingly the rate of growth of this demand betwen 1980 and 1990 is projected to exceed 15.5 per cent -- or about two percentage points above the expected rate for the 1980-1985 period.

The special emphasis group (plant processing equipment) shows comparable dynamism. Food processing machinery shows the highest rate of growth of about 21 per cent per year. This is a bit lower than that expected for the period 1980-1985, but still a very rapid rate indeed. Demand for pulp and paper machinery is expected to reach $ 81.4 million which translates into an annual rate of increase of over 14.5 per cent between 1980-1990. This rate is higher than that projected for this sector between 1980-1985.

3.2.3 The Long-Term Forecasts (2000)

The long-term forecast of the demand for capital goods is optimistic. The growth trend expected in the medium-trend is expected to accelerate further in the long-term particularly as the oil market tightens and LNG revenues reach peak levels.

The long-term demand for non-electrical machinery is expected to top $ 37.3 billion under the most pessimistic forecast and to approach $ 41.5

billion under the most optimistic conditions. In either case, the projected demand for the year 2000 is about 20 times the actual 1980 volume in constant 1980 US dollars. Such a volume is large enough to support a broad production programme of all types of non-electrical machines in Indonesia. Almost half the expected demand for engineering products in Indonesia will be accounted for by non-electrical machinery in the year 2000. This is despite the fact that under the historical trend assumptions demand for capital goods is slated to grow at slower rates than those projected for engineering products.

Special industrial machinery demand is projected to reach about $ 7.5 billion (under the medium forecast). Demand for pulp and paper machinery will account for $ 382 million, whereas the demand for food processing machinery will account for $ 626 million. The largest component of this product group is the demand for construction and mining equipment which is projected to account for about one-half of the total demand for this category ($3.2 billion).

3.3 The Off-Trend Forecasts

The historical trend is not expected to hold as Indonesian planners will certainly intercede to alter the course of the economy and re-structure it to meet their target vectors of output. Repelita IV is already on the drawing boards and the current low ratio of manufacturing value added to GDP and the limited production of non-electrical machinery are the focus of the planners interest and consideration.

If planning has any meaning it is its vision and ability to change the historical course of the economy. This is why our forecasts are adjusted to reflect planners preferences and as such our forecasts become consequences of what might be expected if planners are to realise their targets.

Two primary changes were introduced to alter the historical trend forecasts. First the share of manufacturing is raised to 17.5 per cent of the total GDP and thus all other shares were scaled accordingly. Second, a different rate of growth for GDP was envisioned to correspond to the expected new structure of the economy. The results of such changes are drastic indeed, as is evident in Tables III.3 and III.4. The corresponding growth rates for constant dollar off-trend forecast are indicated in Appendix 9.

3.3.1 The Short-term Forecasts (1985)

The forecast demands for capital goods are highly sensitive to the underlying assumptions about sectoral shares in the structure of GDP. Although the forecasts are sensitive to GDP, they are more markedly sensitive to the assumptions about sectoral shares. The magnitude of sensitivity grows over time, but it is still visible in the short-term.

The demand for non-electrical machinery is projected to reach \$ 4.7 billion under the high GDP scenario, and about \$ 4.3 billion under the low GDP scenario in 1985. Regardless of the GDP forecast, the off-trend demand forecasts are substantially higher than the corresponding values under the historical trend assumptions.

Demand for special industrial machinery reveals the same profile, showing a forecast value of \$ 841 million under the medium GDP scenario in 1985. Demand for food processing machinery is expected to exceed \$ 70 million and demand for pulp and paper machinery \$ 39.8 million. Whereas the demand for food processing machinery is slated to rise under the off-trend scenario, that for pulp and paper appears invariant to this change.

3.3.2 The Medium-Term Forecasts (1990)

The medium-term forecasts reveal more clearly and distinctly the influence of growing off-the-trend. Demand for non-electrical machinery is projected to reach \$ 11.7 billion (or about \$ 3.5 billion above the historical trend projection) by 1990. Similar substantial increases are also noted in the various sub-components of non-electrical machinery. Demand for special industrial machinery will likely exceed \$ 2.1 billion; and demand for other special industrial machinery could exceed \$ 5.4 billion. This argues for a major increase in the demand for plant processing equipment.

Some sub-components of machinery demand will not increase however, as much as the general increase in the group demand. This is particularly evident in the demand for pulp and paper machinery and mining equipment. On the other hand, substantial increases are noted in the demand for food processing machinery, mineral and glass working machinery, and pumps and centrifuges.

Table III.3: DETREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS

INDONESIA

(MILLIONS OF CONSTANT 1990 U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
TOTAL ENGINEERING PRODUCTS (7)	3957.	9183.4	9793.3	10222.4	23875.2	25214.9	25941.4	64922.9	63756.8	71105.6	177630.8	194750.2	198055.4
TOTAL MACHINERY NON-ELECTRIC (71)	1348.	4254.0	4532.3	4741.8	11374.1	11635.8	12049.4	30124.6	32367.4	33039.5	82456.9	90372.2	92033.4
POWER GENERATING MACHINERY (711)	425.	758.3	807.1	843.8	1354.0	2033.6	2125.5	5301.4	5696.0	5913.7	14500.8	15892.7	16183.9
BOILER,STEAM GENERATING MACHINERY (711.1)	156.	116.3	120.7	121.2	232.3	247.1	256.6	485.5	522.7	535.5	1049.1	1147.3	1167.0
STEAM ENGINES (711.3)	3.	44.1	47.3	49.1	113.5	113.9	123.5	308.1	330.9	337.3	902.5	922.9	937.6
AIRCRAFT ENGINES (711.4)	11.	13.3	14.4	14.5	27.2	28.9	30.0	56.4	60.7	62.2	121.5	132.9	135.2
OTHER INTERNAL COMBUSTION ENGINES (711.5)	34.	58.2	60.6	60.8	118.5	126.1	131.0	249.2	268.3	274.9	539.0	590.0	600.2
NUCLEAR REACTORS (711.7)	6.	15.7	16.1	16.1	32.4	34.0	34.2	67.0	71.7	72.4	136.6	149.5	151.4
ENGINES,NES (711.8)	38.	454.3	487.3	510.7	1253.3	1325.6	1365.7	3464.9	3722.5	3795.0	9520.0	10423.3	10596.6
AGRICULTURAL MACHINERY (712)	36.	79.0	82.3	82.3	146.4	135.5	161.2	297.1	319.7	327.4	634.8	694.8	706.7
OFFICE MACHINERY (714)	40.	59.5	61.9	62.0	114.9	122.1	126.7	236.9	255.0	261.2	509.1	557.3	566.8
TYPEWRITERS (714.1)	12.	21.3	22.1	22.2	41.2	43.7	45.4	84.9	91.4	93.6	192.6	199.8	203.3
OFFICE MACHINES,NES (714.9)	8.	7.6	7.9	7.9	13.5	14.3	14.8	27.0	29.1	29.7	57.4	62.8	63.9
METAL WORKING MACHINERY (715)	49.	125.1	133.5	133.4	324.9	343.3	353.4	883.7	949.4	967.6	2418.5	2643.5	2692.0
MACHINE TOOLS (715.1)	36.	103.7	110.7	115.7	271.9	237.2	295.7	741.1	796.2	911.5	2029.5	2223.3	2258.9
TEXTILE MACHINERY (717.1)	170.	547.3	594.4	610.9	1440.9	1522.4	1567.4	3933.1	4225.3	4306.6	10773.4	11803.0	11992.4

Table III.3: DETREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS
(continued)

INDONESIA

(MILLIONS OF CONSTANT 1980 U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
SKIN,LEATHER WORKING MACHINERY (717.2)	3.	6.2	6.4	6.4	12.8	13.6	14.1	27.0	29.1	29.8	58.6	64.1	65.2
SEWING MACHINERY (717.3)	31.	43.5	45.2	45.3	85.1	90.5	93.9	176.4	189.8	194.5	379.7	415.6	422.7
SPECIAL INDUSTRIAL MACHINERY (718)	325.	789.6	841.2	875.6	2052.2	2157.5	2223.9	5580.4	5995.8	6094.6	15273.0	16738.5	16973.4
PAPER AND PULP MACHINERY (718.1)	21.	37.3	38.3	39.0	76.5	91.4	94.6	161.2	173.6	177.9	349.1	382.1	388.7
PRINTING MACHINERY (718.2)	27.	59.5	63.5	65.3	153.1	151.7	166.5	415.2	446.1	454.6	1135.5	1244.0	1264.0
FOOD PROCESSING MACHINERY (718.3)	19.	66.3	70.5	72.7	168.2	177.7	190.1	454.4	488.2	498.2	1241.4	1360.4	1362.4
CONSTRUCTION,MINING MACHINERY (718.4)	220.	331.5	344.5	345.7	544.6	635.3	711.2	1332.9	1434.8	1469.7	2867.0	3138.2	3192.0
MINERAL AND GLASS WORKING MACHINERY (718.5)	38.	109.2	116.4	122.1	280.2	296.0	306.8	759.6	816.0	837.8	2276.9	2275.3	2329.5
OTHER SPECIAL MACHINERY (718.9)	368.	1969.0	2098.7	2212.0	5166.4	5456.6	5636.2	14084.0	15112.3	15486.7	39572.2	42275.7	43163.8
HEATING,COOLING EQUIPMENT (719.1)	171.	341.1	363.5	392.0	932.6	942.7	975.5	2431.5	2612.6	2678.8	6658.1	7297.4	7465.4
PUMPS AND CENTRIFUGES (719.2)	124.	343.7	366.2	391.8	937.5	947.9	972.5	2443.6	2625.6	2668.3	6590.1	7332.3	7434.0
MECHANICAL HANDLING EQUIP (719.3)	124.	339.1	361.5	379.4	934.4	944.7	975.7	2441.6	2623.5	2684.4	6589.4	7331.7	7484.1
POWERED-TOOLS,OTHER (719.5)	53.	37.0	37.3	37.9	67.7	70.8	71.1	133.7	143.0	144.2	258.9	294.1	297.5
SPRAYING,VENDING, OTHER MACHINERY (719.6)	29.	74.6	76.6	76.8	156.2	153.7	164.7	323.4	346.5	349.6	658.5	721.2	729.9
BALL,ROLLER BEARINGS (719.7)	19.	19.6	20.4	20.5	39.6	40.0	41.5	77.4	83.3	85.3	166.1	181.8	184.9
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	143.	313.1	333.2	350.9	903.5	848.4	880.5	2176.8	2338.9	2405.8	5952.2	6524.1	6696.7
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	201.	371.3	396.1	418.3	989.3	1045.0	1096.1	2708.1	2909.9	2996.0	7424.7	8137.6	8359.1

Table III.3: (continued) DETREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS

INDONESIA

(MILLIONS OF CONSTANT 1990 U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
TOTAL ELECTRICAL MACHINERY (72)	782.	1309.6	1360.7	1365.2	2514.3	2573.2	2773.1	5175.5	5570.6	5705.8	11113.5	12164.4	12372.9
ELECTRICAL POWER MACHINERY (722)	297.	469.3	497.3	493.6	919.1	976.2	1013.2	1302.7	2048.1	2098.1	4095.5	4482.9	4559.9
POWER TRANSFORMING MACHINERY (722.1)	224.	366.1	380.5	381.8	709.5	734.3	782.7	1465.1	1577.1	1615.4	3149.9	3447.8	3506.9
SWITCH GEAR, ETC. (722.2)	73.	121.2	126.0	126.5	238.9	254.0	263.7	496.4	534.4	547.4	1069.5	1170.7	1190.8
EQUIPMENT FOR DISTRIBUTION ELECTRICITY (723)	158.	229.3	238.3	239.1	444.4	472.4*	490.2	917.7	987.0	1011.8	1973.0	2159.6	2196.6
INSULATED WIRE AND CABLE (723.1)	135.	201.[illegible]	209.9	210.6	389.7	414.3	429.8	803.5	864.9	885.9	1726.6	1883.8	1922.2
ELECTRIC INSULATED EQUIPMENT (723.2)	24.	41.0	42.7	42.9	84.5	90.0	93.5	178.5	192.2	197.0	396.7	423.3	430.6
ELECTRICAL MACHINERY OTHER (729)	141.	289.6	300.9	301.9	557.5	592.6	614.8	1148.3	1236.0	1266.0	2466.7	2699.9	2746.2
BATTERIES AND ACCUMULATORS (729.1)	81.	113.1	117.5	117.9	214.7	228.2	236.7	440.0	473.5	485.0	943.3	1032.4	1050.1
ELECTRIC LAMPS (729.2)	18.	30.9	32.2	32.3	61.6	65.5	68.0	128.4	138.3	141.6	277.1	303.3	308.5
VALVES, TUBES, ETC. (729.3)	15.	35.7	37.2	37.3	73.7	78.4	91.5	155.6	167.5	171.6	337.0	369.9	375.3
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	25.	37.0	38.0	39.2	76.7	90.4	91.1	158.3	169.7	171.5	321.5	352.3	357.0
MEASURING APPARATUS (729.5)	29.	203.2	217.3	223.2	561.3	593.3	611.4	1551.6	1667.0	1599.5	4263.6	4670.8	4745.6
ELECTRO-MECHANICAL HAND TOOLS (729.6)	6.	16.9	18.1	18.9	45.4	48.0	49.4	124.7	133.9	136.5	342.0	374.7	380.7
OTHERS, NES (729.9)	57.	168.5	173.1	173.5	358.0	375.2	377.7	744.5	797.8	805.3	1518.2	1662.9	1683.5
TOTAL TRANSPORT EQUIPMENT (73)	1227.	2729.4	2805.7	2914.4	5749.2	5934.9	6070.6	11929.0	12782.9	12914.8	24307.3	26624.8	26977.6
RAILWAY VEHICLES (731)	236.	108.9	111.9	112.1	230.9	241.8	243.5	480.1	514.4	519.5	990.2	1073.4	1087.1

Table III.3: OFFTREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS
(continued)
INDONESIA
(MILLIONS OF CONSTANT 1980 U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
LOCOMOTIVES, OTHER (731.3)	6.	36.3	37.3	39.0	78.9	82.7	83.3	164.4	176.2	178.1	335.4	367.5	372.4
PASSENGERS, RAILWAY, TRAMWAY CARS (731.5)	12.	57.9	59.2	63.2	122.3	128.0	128.5	255.0	272.8	274.9	523.4	572.4	578.8
RAILWAY, LOCOMOTIVE CAR PARTS, NES (731.7)	2.	4.8	4.9	4.9	8.1	8.5	8.5	15.4	16.5	16.5	30.4	33.3	33.7
BUSES (732.2)	31.	28.2	29.0	29.0	44.7	46.7	47.0	82.5	88.4	89.2	161.1	176.4	178.6
LORRIES AND TRUCKS (732.3)	186.	1070.3	1101.1	1114.3	2294.0	2414.4	2423.5	4785.9	5128.9	5183.3	9769.0	10700.9	10845.3
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	33.	47.5	49.4	53.6	91.9	97.6	101.3	189.4	203.9	208.8	407.0	445.4	453.1
TRACTORS FOR TR-TRAILERS (732.5)	12.	7.9	8.1	9.1	5.8	6.1	6.2	4.3	4.7	5.0	2.2	2.7	3.2
SHIPS AND BOATS (735)	35.	252.3	259.2	259.7	531.0	536.4	559.9	1101.9	1180.6	1191.4	2246.4	2460.2	2490.0
SHIPS AND BOATS NON-WAR (735.3)	16.	48.3	49.5	49.7	102.4	107.3	108.1	213.2	228.4	230.6	435.3	475.6	482.7
SHIPS AND BOATS NES (735.3)	17.	69.5	71.5	71.9	136.7	143.3	144.6	276.3	296.3	299.6	556.0	603.5	618.2

SOURCE: ECONOMETRIC RESEARCH LTD.

Note: The growth rates corresponding to the off-trend forecast in this table (based on constant 1980 US dollars) are contained in Appendix 9.

Table III.4: OFFTREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS

INDONESIA

(MILLIONS OF CURRENT U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
TOTAL ENGINEERING PRODUCTS (7)	3357.	13764.	14383.	15372.	51985.	52151.	54130.	137539.	201614.	209667.	770348.	788059.	816127.
TOTAL MACHINERY NON-ELECTRIC (71)	1948.	6376.	6664.	6392.	23648.	24144.	25143.	91659.	93550.	96958.	357474.	365632.	379242.
POWER GENERATING MACHINERY (711)	425.	1136.	1187.	1244.	4173.	4360.	4435.	15130.	16463.	17061.	62865.	64310.	66689.
BOILER,STEAM GENERATING MACHINERY (711.1)	156.	174.	178.	179.	496.	510.	536.	1477.	1511.	1572.	4544.	4643.	4809.
STEAM ENGINES (711.3)	3.	66.	69.	72.	242.	248.	258.	937.	956.	990.	3652.	3734.	3864.
AIR CRAFT ENGINES (711.4)	11.	21.	21.	21.	58.	60.	63.	172.	176.	183.	527.	538.	557.
OTHER INTERNAL COMBUSTION ENGINES (711.5)	34.	87.	83.	90.	253.	260.	273.	758.	775.	807.	2337.	2387.	2473.
NUCLEAR REACTORS (711.7)	6.	24.	24.	24.	69.	70.	71.	204.	207.	213.	592.	605.	624.
ENGINES,NES (711.9)	38.	682.	716.	753.	2678.	2736.	2950.	10543.	10759.	11137.	41272.	42282.	43665.
AGRICULTURAL MACHINERY (712)	36.	118.	121.	121.	313.	321.	336.	904.	924.	961.	2752.	2812.	2912.
OFFICE MACHINERY (714)	40.	89.	91.	91.	245.	252.	264.	721.	737.	767.	2207.	2255.	2336.
TYPEWRITERS (714.1)	12.	32.	33.	33.	89.	90.	95.	258.	264.	275.	792.	809.	838.
OFFICE MACHINES,NES (714.3)	9.	11.	12.	12.	29.	30.	31.	82.	84.	87.	249.	254.	263.
METAL WORKING MACHINERY (715)	49.	189.	196.	206.	694.	709.	737.	2689.	2744.	2840.	10485.	10721.	11093.
MACHINE TOOLS (715.1)	36.	155.	163.	171.	580.	593.	617.	2255.	2301.	2382.	8799.	8997.	9308.
TEXTILE MACHINERY (717.1)	170.	820.	859.	901.	3077.	3143.	3271.	11967.	12212.	12638.	46706.	47751.	49417.

Table III.4: DEFTREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS
(continued)

INDONESIA

(MILLIONS OF CURRENT U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
SKIN,LEATHER WORKING MACHINERY (717.2)	3.	9.	9.	10.	27.	28.	30.	82.	84.	88.	254.	260.	269.
SEWING MACHINERY (717.3)	31.	65.	66.	67.	182.	187.	196.	537.	549.	571.	1646.	1682.	1742.
SPECIAL INDUSTRIAL MACHINERY (718)	125.	1183.	1237.	1293.	4382.	4474.	4640.	16979.	17329.	17885.	66213.	67733.	69342.
PAPER AND PULP MACHINERY (718.1)	21.	56.	57.	57.	163.	168.	177.	491.	502.	522.	1513.	1546.	1602.
PRINTING MACHINERY (718.2)	27.	89.	93.	98.	327.	334.	347.	1263.	1285.	1334.	4923.	5034.	5209.
FOOD PROCESSING MACHINERY (718.3)	19.	99.	104.	107.	359.	367.	376.	1383.	1411.	1438.	5382.	5505.	5614.
CONSTRUCTION,MINING MACHINERY (718.4)	220.	497.	507.	510.	1377.	1415.	1484.	4056.	4147.	4313.	12429.	12633.	13154.
MINERAL AND GLASS WORKING MACHINERY (718.5)	38.	164.	171.	180.	598.	611.	640.	2311.	2358.	2459.	9004.	9207.	9599.
OTHER SPECIAL MACHINERY (718.9)	968.	2951.	3086.	3247.	11033.	11365.	11761.	42853.	43738.	45447.	167221.	171069.	177865.
HEATING,COOLING EQUIPMENT (719.1)	171.	511.	534.	563.	1906.	1945.	2036.	7398.	7551.	7861.	28865.	29523.	30763.
PUMPS AND CENTRIFUGES (719.2)	124.	515.	539.	563.	1917.	1957.	2029.	7435.	7589.	7831.	29004.	29670.	30634.
MECHANICAL HANDLING EQUIP (719.3)	124.	508.	532.	559.	1910.	1950.	2036.	7429.	7583.	7878.	29009.	29668.	30840.
POWERED-TOOLS,OTHER (719.5)	53.	55.	56.	56.	145.	146.	148.	407.	413.	423.	1166.	1190.	1226.
SPRAYING,VENDING, OTHER MACHINERY (719.6)	29.	112.	113.	113.	334.	338.	344.	984.	1001.	1026.	2855.	2918.	3008.
BALL,ROLLER BEARINGS (719.7)	19.	29.	30.	30.	80.	83.	87.	235.	241.	250.	720.	736.	762.
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	143.	469.	490.	517.	1716.	1751.	1837.	6623.	6760.	7060.	25905.	26408.	27595.
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	201.	557.	582.	617.	2113.	2157.	2266.	8240.	8410.	8792.	32189.	32923.	34445.

Table III.4: OFFTREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS
(continued) INDONESIA
(MILLIONS OF CURRENT U.S. DOLLARS)

PRODUCTS	1980 ACTUAL VALUES	1985 LOW	1985 MED	1985 HIGH	1990 LOW	1990 MED	1990 HIGH	1995 LOW	1995 MED	1995 HIGH	2000 LOW	2000 MED	2000 HIGH
TOTAL ELECTRICAL MACHINERY (72)	782.	1963.	2001.	2313.	3370.	5318.	5787.	15747.	16101.	15744.	48188.	49224.	50985.
ELECTRICAL POWER MACHINERY (722)	297.	703.	717.	722.	1961.	2315.	2114.	5789.	5920.	6157.	17755.	18140.	18790.
POWER TRANSFORMING MACHINERY (722.1)	224.	549.	560.	563.	1515.	1557.	1633.	4458.	4558.	4741.	13656.	13951.	14451.
SWITCH GEAR, ETC. (722.2)	73.	182.	185.	197.	510.	524.	550.	1510.	1544.	1607.	4637.	4737.	4907.
EQUIPMENT FOR DISTRIBUTION ELECTRICITY (723)	158.	344.	350.	353.	949.	975.	1021.	2792.	2855.	2969.	8553.	8733.	9052.
INSULATED WIRE AND CABLE (723.1)	135.	303.	309.	310.	832.	855.	897.	2445.	2500.	2600.	7485.	7647.	7921.
ELECTRIC INSULATED EQUIPMENT (723.2)	24.	62.	63.	63.	181.	186.	195.	543.	556.	578.	1677.	1713.	1775.
ELECTRICAL MACHINERY OTHER (729)	141.	434.	442.	445.	1190.	1223.	1283.	3494.	3572.	3715.	10694.	10925.	11316.
BATTERIES AND ACCUMULATORS (729.1)	81.	170.	173.	174.	459.	471.	494.	1339.	1369.	1423.	4083.	4179.	4327.
ELECTRIC LAMPS (729.2)	13.	46.	47.	48.	132.	135.	142.	391.	400.	416.	1201.	1227.	1271.
VALVES, TUBES, ETC. (729.3)	15.	54.	55.	55.	157.	162.	170.	473.	484.	504.	1461.	1493.	1547.
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	25.	55.	56.	56.	164.	166.	169.	482.	490.	503.	1394.	1426.	1471.
MEASURING APPARATUS (729.5)	29.	305.	320.	337.	1199.	1225.	1276.	4721.	4818.	4987.	19485.	18900.	19555.
ELECTRO-MECHANICAL HAND TOOLS (729.6)	6.	25.	27.	28.	97.	93.	103.	379.	387.	401.	1483.	1516.	1569.
OTHERS, NES (729.9)	57.	253.	255.	256.	765.	775.	788.	2265.	2306.	2363.	6582.	6723.	6937.
TOTAL TRANSPORT EQUIPMENT (73)	1227.	4091.	4125.	4150.	12277.	12438.	12667.	36296.	36946.	37900.	105373.	107737.	111167.
RAILWAY VEHICLES (731)	236.	163.	164.	155.	493.	499.	508.	1461.	1487.	1524.	4243.	4343.	4480.

Table III.4: OFFTREND FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS
(continued)

INDONESIA

(MILLIONS OF CURRENT U.S. DOLLARS)

	1980	1985			1990			1995			2000		
PRODUCTS	ACTUAL VALUES	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH
LOCOMOTIVES, OTHER (731.3)	6.	55.	56.	56.	168.	171.	174.	500.	509.	523.	1456.	1487.	1534.
PASSENGERS' RAILWAY, TRAMWAY CARS (731.5)	12.	87.	87.	87.	261.	264.	268.	776.	788.	807.	2267.	2316.	2385.
RAILWAY, LOCOMOTIVE CAR PARTS, NES (731.7)	2.	7.	7.	7.	17.	19.	18.	47.	48.	49.	132.	135.	139.
BUSES (732.2)	31.	42.	43.	43.	95.	97.	98.	251.	255.	262.	699.	714.	736.
LORRIES AND TRUCKS (732.3)	186.	1605.	1619.	1529.	4899.	4764.	5057.	14562.	14824.	15211.	42351.	43301.	44690.
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	33.	71.	73.	73.	196.	202.	211.	576.	589.	613.	1764.	1803.	1867.
TRACTORS FOR TR-TRAILERS (732.5)	12.	12.	12.	12.	12.	13.	13.	13.	14.	15.	9.	11.	13.
SHIPS AND BOATS (735)	35.	378.	381.	393.	1134.	1149.	1163.	3351.	3412.	3496.	9733.	9955.	10261.
SHIPS AND BOATS NON-WAR (735.3)	16.	72.	73.	73.	219.	222.	226.	649.	660.	677.	1987.	1923.	1989.
SHIPS AND BOATS NES (735.3)	17.	104.	105.	136.	232.	296.	302.	841.	856.	879.	2418.	2455.	2547.

SOURCE: ECONOMETRIC RESEARCH LTD.

3.3.3 The Long-Term Forecasts (2000)

Manufacturing value added is projected to reach 25 per cent of total GDP in the year 2000, and this assumption seems to result in some very substantial and perhaps infeasible demands for machinery. The total demand for non-electrical machinery is put at $ 82 billion for the low GDP scenario but jumps to $ 92 billion for the high GDP scenario. This translates into an annual rate of growth of over 20 per cent for the low GDP scenario between 1980 and 2000 and an annual rate of growth of 21.3 per cent for the high GDP scenario. Both of these rates are perhaps too high to sustain over such a long period. However, it is clear that any restructuring of the Indonesian economy with higher shares for manufacturing will _ipso facto_ translate into large demands for machinery which would either be produced locally or have to be imported.

The demands for the various types of machinery are also projected to rise sharply; the demand for special industrial machinery is projected to exceed $ 16.7 billion for the medium GDP scenario in the year 2000; and that for other special machinery is put at $ 42.3 billion.

The off-trend forecasts are particularly tied to the specific assumptions about the structure of production envisaged, but such assumptions can be changed (scaled down) and other sets of forecasts generated. This is why we explained in detail the methodology and our assumption in the preceding sections. Indonesian planners may prefer a different profile or might be interested in the sensitivity of the forecasts to different assumptions.[10/] These experiments can be easily performed.

3.4 Concluding Observations

There are two ways to illustrate the utility of our forecasts and the elements of a strategy for the development of a viable plant processing industry in Indonesia. The first involves drawing a master matrix which lists the products to the smallest available detail and then classifies each product according to the complexity of technology, the factor intensities involved, the infrastructure required, the size of the respective domestic, sub-regional and regional market, and the minimum viable scale of production. It is only within this broad framework that a comprehensive and comparative picture may be obtained. Alternatively, a detailed product by product discussion may be undertaken taking into consideration the relevant criteria developed above.

Footnotes

1/ Although it would have been desirable, it was not possible to treat replacement and new investment separately. Replacement investment will undoubtedly become more important when Indonesia expands its manufacturing sector. However, probably because replacement investment has been relatively unimportant over the data period, there is no data which can support separate treatment of these two types of investment. To the extent that replacement investment becomes more important, these forecasts may understate the future demand for capital goods.

2/ It is also necessary that the mix of inputs not change over time. Fixed ratios of capital goods input to gross output and gross output to value added are assumed.

3/ The demand for each capital good is measured in current US dollars, while GDP is measured in current Rupiah.

4/ See Appendix 7.

5/ The use of constant price data for the forecasts also requires conversion of export and domestic production data to constant prices, for products where these are significant. This conversion is difficult since there is no time series data on price indexes for capital goods for Indonesia. A second problem with forecasting in constant price terms is the difficulty of incorporating changes in the relative price of oil into forecasts of constant price GDP and GDP components. Changes in oil prices can be incorporated very naturally into forecasts computed in current prices.

6/ Poor results for two equations deserve special mention. The demand for agricultural machinery (SITC 712) is difficult to forecast by these methods because rapid mechanisation of agriculture (substitution of machinery for labour) may take place while, at the same time, agricultural output grows slowly (or not at all). Thus there is no strong relationship between output growth and demand for machinery in this sector. A second product where results are relatively poor (R^2 = 0.43) is food processing machinery. The forecasting equation for imports of this product was substantially better (R^2 = 0.64) than the equation for demand, suggesting possible problems with the data on domestic production.

7/ This result is surprising and may result from collinearity between the time trend variable and the oil-revenue variable. This collinearity will not seriously affect the forecasts so long as the growth of oil-revenues does not depart drastically from past trends.

8/ The forecasting equations fit well, as indicated by low estimated standard errors and high t-ratios, except for the agricultural sector. The output of this sector is extremely volatile, as a result of variation in weather conditions.

9/ These forecasts were based on targets desired by Indonesian planners.

10/ The differences between these forecasts and those presented in Tables III.1 and III.2 (the "Trend" forecasts) give some indication of the sensitivity of the results to changes in the forecast share of manufacturing.

APPENDIXES

APPENDIX 1

SECTOR CLASSIFICATION

GDP1:	Agriculture, hunting, forestry and fishing
GDP2:	Mining and quarrying
GDP3:	Manufacturing
GDP4:	Electricity, gas and water
GDP5:	Construction
GDP6:	Transport, storage and communication
GDP7:	Wholesale and retail trade
GDP8:	Services

APPENDIX 2

HISTORICAL GROSS DOMESTIC PRODUCT

INDONESIA

(MILLIONS OF RUPIAHS)

YEAR	AGRICULTURE	MINING	MANUFACTURING	ELECTRICITY	CONSTRUCTION	TRANSPORTATION	WHOLESALE & RETAIL TRADE	SERVICES
1967	457300.	22300.	52000.	3500.	14100.	19510.	148900.	120500.
1968	1074100.	87100.	178600.	3000.	44600.	57400.	352500.	282500.
1969	1339300.	123200.	250700.	12000.	74800.	76900.	475900.	359500.
1970	1575000.	172600.	311900.	15000.	100300.	95800.	618600.	451100.
1971	1646000.	294000.	307000.	18000.	128000.	162000.	592000.	525000.
1972	1837000.	491000.	448000.	20000.	174000.	182000.	769000.	643000.
1973	2710000.	831000.	653000.	30000.	262000.	257000.	1118000.	895000.
1974	3497000.	2374000.	830000.	52000.	406000.	442000.	1775000.	1272000.
1975	4303000.	2485000.	1124000.	70000.	590000.	521000.	2104000.	1746000.
1976	4912000.	2930000.	1453000.	88000.	813000.	663000.	2552000.	2145000.
1977	5306000.	3600000.	1817000.	106000.	1023000.	821000.	2959000.	2780000.
1978	6706000.	4358000.	2135000.	118000.	1242000.	980000.	3450000.	3420000.
1979	9394000.	6390000.	2614000.	149000.	1790000.	1300000.	4603000.	4603000.
1980	11253000.	11673000.	3346000.	225000.	2524000.	1706000.	6168000.	6370000.

SOURCE: ECONOMETRIC RESEARCH LTD.

APPENDIX 3

TREND FORECASTS OF SECTORAL GDP

INDONESIA

(MILLIONS OF RUPIAHS)

YEAR	GDP1	GDP2	GDP3	GDP4	GDP5	GDP6	GDP7	GDP9
				LOW				
1980	11253000.	11673000.	3846000.	22500.	2524000.	1706000.	6168000.	6370000.
1985	21524800.	15651300.	3039550.	567302.	6831840.	4251130.	15505700.	20627600.
1990	53791300.	18638000.	29643900.	1809370.	22426400.	13395300.	48798800.	77901900.
1995	131890000.	17600000.	83313600.	5669390.	70921900.	41736400.	152151000.	277699000.
2000	320987000.	17222700.	278679000.	17718300.	222328000.	130227000.	474744000.	955915000.
				MEDIUM				
1980	11253000.	11673000.	3845000.	22500.	2524000.	1706000.	6168000.	6370000.
1985	21611800.	17236900.	3135340.	570039.	6859460.	4268320.	15568400.	20711000.
1990	54326800.	23621800.	29921100.	1827930.	22649700.	13518500.	49284700.	78677500.
1995	133725000.	24759300.	91562800.	5748690.	71913700.	42320200.	154279000.	281583000.
2000	326773000.	26404600.	281703000.	18039300.	226335000.	132575000.	483302000.	973148000.
				HIGH				
1980	11253000.	11673000.	3946010.	22500.	2524000.	1706000.	6168000.	6370000.
1985	21639700.	17758300.	3146730.	570309.	6868010.	4273640.	15587800.	20736800.
1990	55122700.	33443000.	23359310.	1954770.	22991500.	13716600.	50006700.	79830100.
1995	136536000.	40724600.	32467010.	5869560.	73425800.	43210000.	157523000.	287503000.
2000	335509000.	49627100.	231287010.	18520500.	232346000.	136119000.	496898000.	999163000.

SOURCE: ECONOMETRIC RESEARCH LTD.

APPENDIX 4

OFFTREND FORECASTS OF SECTORAL GDP

INDONESIA

(MILLIONS OF RUPIAHS)

YEAR	GDP1	GDP2	GDP3	GDP4	GDP5	GDP6	GDP7	GDP8
				LOW				
1980	11253000.	11673000.	3846000.	22500.	2524000.	1706000.	6168000.	6370000.
1985	21135700.	15651300.	13351400.	557539.	6708350.	4174290.	15225400.	20254800.
1990	51834800.	18638000.	35577000.	1744140.	21610700.	12838400.	47023900.	75068400.
1995	122854000.	17760000.	135956000.	5281390.	66068000.	38880000.	141738000.	258693000.
2000	284088000.	17222700.	522603000.	15682000.	136770000.	115257000.	420170000.	846023000.
				MEDIUM				
1980	11253000.	11673000.	3846000.	22500.	2524000.	1706000.	6168000.	6370000.
1985	21169100.	17236900.	13560700.	558420.	6718960.	4180890.	15249500.	20286800.
1990	52187800.	23621800.	37602500.	1756010.	21757900.	12986300.	47344200.	75579700.
1995	124347000.	24758300.	133321000.	5345550.	66870600.	39352300.	143460000.	261836000.
2000	288319000.	26404600.	533341000.	15348700.	200116000.	117217000.	427315000.	860417000.
				HIGH				
1980	11253000.	11673000.	3846000.	22500.	2524000.	1706000.	6158000.	6370000.
1985	21178400.	17758300.	13623900.	558666.	6721910.	4182730.	15256200.	20295700.
1990	52630100.	33449000.	33460100.	1770300.	21942300.	13096300.	47745400.	76220200.
1995	126444000.	40724600.	144508000.	5435720.	67398500.	40016100.	145980000.	266252000.
2000	295906000.	49627100.	553092300.	16334400.	214356000.	120052000.	437650000.	881226000.

SOURCE: ECONOMETRIC RESEARCH LTD.

APPENDIX 5

GROSS DOMESTIC PRODUCT FORECASTS

INDONESIA

(MILLIONS OF RUPIAHS)

YEAR	TOTAL GDP LOW	TOTAL GDP MEDIUM	TOTAL GDP HIGH	NON-OIL GDP LOW	NON-OIL GDP MEDIUM	NON-OIL GDP HIGH
1980	43765000.	43765000.	43765000.	32092000.	32092000.	32092000
1981	43568406.	43669416.	43668406.	31218268.	31219268.	31218268
1982	49214308.	49214339.	49202915.	38758111.	38758111.	38897692
1983	51732767.	61732767.	62467907.	49244821.	49244921.	49346764
1984	76247154.	77030364.	77642608.	62158300.	52297000.	62368578
1985	94058740.	95951323.	96580806.	78407422.	78724405.	78822544
1986	114351190.	117847420.	119696160.	99620139.	93135193.	99521199
1987	140369130.	145138000.	149541530.	124042090.	124951870.	125648880
1988	173459500.	179612670.	184562440.	156016430.	157322060.	158625809
1989	214206980.	220334730.	229693140.	196199190.	197936970.	200268730
1990	255395460.	272835090.	286314300.	246757420.	243214320.	252865330
1991	328178450.	336998950.	352953800.	309750790.	313084340.	318085150
1992	407090830.	417365430.	436394920.	388847000.	393344980.	400163140
1993	516220390.	518439680.	541090670.	488150180.	434130250.	503391840
1994	533733159.	645335650.	572392580.	612826020.	620903030.	633216710
1995	737130900.	804830130.	937253380.	769370830.	750131840.	796534770
1996	993577730.	1005297830.	1044455100.	965945750.	990235780.	1002047600
1997	1230279100.	1257047510.	1304615400.	1212766800.	1231697700.	1260514800
1998	1540102900.	1573372930.	1531529400.	1522698200.	1547604700.	1585659300
1999	1923192500.	1970835730.	2042399700.	1911884000.	1944802200.	1994678900
2000	2417922000.	2470279200.	2559833500.	2400599300.	2443873600.	2509206400

SOURCE: ECONOMETRIC RESEARCH LTD.

APPENDIX 6

GROSS DOMESTIC PRODUCT FORECASTS
INDONESIA
(MILLIONS OF RUPIAHS)

OIL GDP

YEAR	LOW	MEDIUM	HIGH
1980	11673000.	11673000.	11673000.
1981	12450138.	12450139.	12450138.
1982	9456197.	9456197.	10309223.
1983	12487346.	12487346.	13121143.
1984	14039854.	14003364.	15274110.
1985	15551318.	17236913.	17758262.
1986	16233993.	19652232.	20174963.
1987	16927014.	20156139.	22892643.
1988	17443074.	21290609.	25936634.
1989	19007793.	22397822.	29424411.
1990	18638042.	23621766.	33448976.
1991	18327652.	23904608.	34774650.
1992	18243838.	24023456.	36231773.
1993	19070200.	24243393.	37598828.
1994	17907128.	24492622.	39175868.
1995	17739974.	24759233.	40724615.
1996	17631993.	25052045.	42407498.
1997	17512207.	25353798.	44101599.
1998	17434631.	25688071.	45869171.
1999	17308475.	26035440.	47710794.
2000	17222700.	26404580.	49627061.

SOURCE: ECONOMETRIC RESEARCH LTD.

Appendix 7

Comparison of Forecasting Equations for Imports
in Current and Constant Prices

Products	GDP Component	R^2 Current Price	R^2 Constant Price
Total Engineering Products (7)	GDP3	.90	.82
Total Machinery non-electric (71)	GDP3	.90	.84
Total Electrical Machinery (72)	GDP (current level)	.88	.83
Power Generating Machinery (711)	GDP3	.82	.88
Boiler, Steam Generating Machinery (711.1)	GDP (current level)	.90	.80
Steam Engines (711.3)	GDP3	.41	.22
Aircraft Engines (711.4)	GDP (current level)	.34	.19
Other Internal Combustion Engines (711.5)	GDP (current level)	.90	.73
Nuclear Reactors (711.7)	GDP4	.76	.80
Engines, nes (711.8)	GDP3	.71	.89
Agricultural Machinery (712)	GDP (current level)	.16	.09
Office Machinery (714)	GDP (current level)	.90	.87
Typewriters (714.1)	GDP (current level)	.93	.79
Office Machines, nes (714.9)	GDP (current level)	.54	.14
Metal Working Machinery (715)	GDP3	.76	.78
Machine Tools (715.1)	GDP3	.51	.31
Textile and Leather Machinery (717)	GDP3	.77	.66
Textile Machinery (717.1)	GDP3	.74	.64
Skin, Leather Working Machinery (717.2)	GDP (current level)	.98	.94
Sewing Machinery (717.3)	GDP (current level)	.91	.59
Special Industrial Machinery (718)	GDP3	.84	.86
Paper and Pulp Machinery (718.1)	GDP (current level)	.86	.70
Food Processing Machinery (718.3)	GDP3	.64	.48
Construction, Mining Machinery (718.4)	GDP (current level)	.67	.65
Mineral and Glass Working Machinery (718.5)	GDP3	.76	.83
Other Special Machinery (719)	GDP3	.93	.81
Heating, Cooling Equipment (719.1)	GDP3	.95	.61

Appendix 7 (con't) ...

Products	Component	R^2 Current Price	R^2 Constant Price
Pumps and Centrifuges (719.2)	GDP3	.89	.79
Mechanical Handling Equipment (719.3)	GDP3	.86	.77
Powered Tools, Other (719.5)	GDP5	.72	.16
Spraying, Vending Other Machinery (719.6)	GDP5	.78	.10
Ball, Roller Bearings (719.7)	GDP (current level)	.93	.65
Machinery and Mechanical Appliances nes (719.8)	GDP3	.86	.74
Parts and Accessories of Machinery, nes (719.9)	GDP3	.97	.77
Electrical Power Machinery (722)	GDP (current level)	.90	.87
Equipment for Distributing Electricity (723)	GDP (current level)	.93	.88
Insulated Wire and Cable (723.1)	GDP (current level)	.90	.86
Electric Insulated Equipment (723.2)	GDP (current level)	.88	.76
Electrical Machinery Other (729)	GDP (current level)	.95	.86
Batteries and Accumulators (729.1)	GDP (current level)	.78	.48
Electric Lamps (729.2)	GDP (current level)	.88	.80
Valves, Tubes, etc. (729.3)	GDP (current level)	.81	.70
Automotive Electrical Equipment (729.4)	GDP6	.78	.55
Measuring Apparatus (729.5)	GDP3	.49	.48
Electro-Mechanical Hand Tools (729.6)	GDP3	.60	.74
Other Electrical, nes (729.9)	GDP5	.93	.20
Railway Vehicles (731)	GDP6	.59	.09
Locomotives, Other (731.3)	GDP6	.70	.56
Passenger: Railway, Tramway Cars (731.5)	GDP6	.61	.03
Railway, Locomotive Car Parts, nes (731.7)	GDP6	.11	.14
Buses (732.2)	GDP6	.05	.02
Lorries and Trucks (732.3)	GDP6	.88	.49
Special Purpose Lorries, Trucks and Vans (732.4)	GDP (current level)	.51	.48
Tractors for Trailers (732.5)	GDP6	.24	.003

Appendix 7 (con't) ...

Products	GDP Component	R^2 Current Price	R^2 Constant Price
Ships and Boats (735)	GDP6	.69	.57
Ships and Boats (non-war) (735.3)	GDP6	.52	.44
Ships and Boats, nes (735.9)	GDP6	.51	.41

Note: These equations forecast imports and, as a result, may differ from those reported in the text, which forecast domestic demand.

APPENDIX 8

"TREND" GROWTH RATES CALCULATED FROM
THE FORECAST OF THE APPARENT DEMAND
FOR CAPITAL GOODS IN INDONESIA
(BASED ON CONSTANT US DOLLAR)
(SEE TABLE III.1)

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1985	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.149950	.157481	.159747
TOTAL MACHINERY NON-ELECTRIC (71)	.132435	.139848	.142186
POWER GENERATING MACHINERY (711)	.085016	.092087	.094492
BOILER,STEAM GENERATING MACHINERY (711.1)	-.057290	-.049772	-.049986
STEAM ENGINES (711.3)	.637096	.647722	.649466
AIR CRAFT ENGINES (711.4)	.056902	.064399	.065873
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.113496	.122532	.123272
NUCLEAR REACTORS (711.7)	.231110	.238664	.241634
ENGINES,NES (711.8)	.578598	.588923	.591754
AGRICULTURAL MACHINERY (712)	.170083	.178838	.179699
OFFICE MACHINERY (714)	.084837	.093097	.093803
TYPEWRITERS (714.1)	.122166	.130472	.131493
OFFICE MACHINES,NES (714.9)	.000079	.005288	.007853
METAL WORKING MACHINERY (715)	.158416	.165759	.167512
MACHINE TOOLS (715.1)	.190141	.197599	.193502
TEXTILE MACHINERY (717.1)	.213384	.221149	.223152
SKIN,LEATHER WORKING MACHINERY (717.2)	.128136	.135322	.135322

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1985

	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.070103	.078339	.078816
SPECIAL INDUSTRIAL MACHINERY (718)	.154853	.162366	.164549
PAPER AND PULP MACHINERY (718.1)	.113314	.128175	.129335
PRINTING MACHINERY (718.2)	.128521	.135347	.137140
FOOD PROCESSING MACHINERY (718.3)	.248343	.256472	.259156
CONSTRUCTION,MINING MACHINERY (718.4)	.085456	.093839	.094600
MINERAL AND GLASS WORKING MACHINERY (718.5)	.141350	.148396	.149604
OTHER SPECIAL MACHINERY (719)	.142924	.150440	.152876
HEATING,COOLING EQUIPMENT (719.1)	.114702	.122029	.124600
PUMPS AND CENTRIFUGES (719.2)	.192556	.200426	.202516
MECHANICAL HANDLING EQUIPMENT (719.3)	.188057	.195966	.199322
POWERED-TOOLS,OTHER (719.5)	-.067471	-.062091	-.061126
SPRAYING,VENDING, OTHER MACHINERY (719.6)	.214412	.222238	.223779
BALL,ROLLER BEARINGS (719.7)	.005287	.013363	.014354
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	.144001	.151417	.153794
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	.089320	.096572	.099379
TOTAL ELECTRICAL MACHINERY (72)	.108629	.117149	.117887

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1985

	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.095819	.104371	.105139
POWER TRANSFORMING MACHINERY (722.1)	.103241	.111786	.112545
SWITCH GEAR, ETC. (722.2)	.105838	.114462	.115345
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.077332	.085659	.086387
INSULATED WIRE AND CABLE (723.1)	.083828	.092284	.093012
ELECTRIC INSULATED EQUIPMENT (723.2)	.116608	.125718	.126771
ELECTRICAL MACHINERY OTHER (729)	.154824	.163699	.164471
BATTERIES AND ACCUMULATORS (729.1)	.069044	.077235	.077968
ELECTRIC LAMPS (729.2)	.114133	.123354	.124051
VALVES, TUBES, ETC. (729.3)	.197292	.207189	.207837
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.087239	.094522	.095724
MEASURING APPARATUS (729.5)	.413703	.423027	.425528
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.180529	.189023	.190693
OTHER, NES (729.9)	.248053	.256190	.257876
TOTAL TRANSPORT EQUIPMENT (73)	.179472	.187276	.189450
RAILWAY VEHICLES (731)	-.176061	-.170707	-.169283
LOCOMOTIVES, OTHER (731.3)	.445120	.454824	.457759

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1985

	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (731.5)	.371025	.379277	.381633
RAILWAY,LOCOMOTIVE CAR PARTS, NES (731.7)	.160693	.170017	.170017
BUSES (732.2)	-.011237	-.005823	-.004487
LORRIES AND TRUCKS (732.3)	.426687	.436239	.439083
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.077259	.085286	.095163
TRACTORS FOR TR-TRAILERS (732.5)	-.078347	-.071619	-.063419
SHIPS AND BOATS (735)	.492382	.502272	.504286
SHIPS AND BOATS NON-WAR (735.3)	.248495	.256401	.259831
SHIPS AND BOATS NES (735.9)	.341309	.350111	.352994

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1990

	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.157949	.163533	.164905
TOTAL MACHINERY NON-ELECTRIC (71)	.149077	.154617	.156039
POWER GENERATING MACHINERY (711)	.123391	.128804	.131290
BOILER, STEAM GENERATING MACHINERY (711.1)	.040754	.047202	.051160
STEAM ENGINES (711.3)	.380969	.387529	.388875
AIR CRAFT ENGINES (711.4)	.099443	.106129	.111269
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.132984	.140049	.144404
NUCLEAR REACTORS (711.7)	.197424	.203197	.204520
ENGINES, NES (711.8)	.366428	.373001	.374438
AGRICULTURAL MACHINERY (712)	.150535	.157494	.161668
OFFICE MACHINERY (714)	.112404	.119185	.123332
TYPEWRITERS (714.1)	.131567	.138253	.142605
OFFICE MACHINES, NES (714.9)	.059179	.065294	.069961
METAL WORKING MACHINERY (715)	.162538	.168069	.169267
MACHINE TOOLS (715.1)	.179662	.185249	.186459
TEXTILE MACHINERY (717.1)	.191592	.197282	.199509
SKIN, LEATHER WORKING MACHINERY	.141991	.148935	.153091

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1990

	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.106259	.113086	.117199
SPECIAL INDUSTRIAL MACHINERY (718)	.160136	.165720	.167044
PAPER AND PULP MACHINERY (718.1)	.136766	.143846	.149265
PRINTING MACHINERY (718.2)	.146010	.151478	.152628
FOOD PROCESSING MACHINERY (718.3)	.203480	.209314	.210262
CONSTRUCTION,MINING MACHINERY (718.4)	.113491	.120330	.124493
MINERAL AND GLASS WORKING MACHINERY (718.5)	.148547	.154027	.154966
OTHER SPECIAL MACHINERY (719)	.155461	.161040	.162501
HEATING,COOLING EQUIPMENT (719.1)	.140800	.146308	.147839
PUMPS AND CENTRIFUGES (719.2)	.179873	.185554	.186838
MECHANICAL HANDLING EQUIPMENT (719.3)	.178850	.184540	.185937
POWERED-TOOLS,OTHER (719.5)	.029359	.034021	.034848
SPRAYING,VENDING, OTHER MACHINERY (719.6)	.190901	.196643	.197531
BALL,ROLLER BEARINGS (719.7)	.070134	.076776	.080747
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	.153642	.159200	.160654
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	.129601	.135063	.136753
TOTAL ELECTRICAL MACHINERY (72)	.123910	.130791	.134948

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1990

	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.119472	.126363	.130561
POWER TRANSFORMING MACHINERY (722.1)	.122200	.129093	.133273
SWITCH GEAR, ETC. (722.2)	.125427	.132345	.135597
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.108949	.115746	.119880
INSULATED WIRE AND CABLE (723.1)	.111833	.118660	.122776
ELECTRIC INSULATED EQUIPMENT (723.2)	.135946	.143132	.147501
ELECTRICAL MACHINERY OTHER (729)	.147368	.154395	.158648
BATTERIES AND ACCUMULATORS (729.1)	.102389	.109132	.113195
ELECTRIC LAMPS (729.2)	.130917	.137881	.142151
VALVES, TUBES, ETC. (729.3)	.176468	.183763	.188363
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.125870	.131344	.132643
MEASURING APPARATUS (729.5)	.293429	.299625	.300981
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.178206	.183822	.185280
OTHER, NES (729.9)	.208933	.214784	.215845
TOTAL TRANSPORT EQUIPMENT (73)	.174243	.179923	.181210
RAILWAY VEHICLES (731)	-.018014	-.013302	-.012241
LOCOMOTIVES, OTHER (731.3)	.301769	.308084	.309548

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1990	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (731.5)	.265871	.271831	.272863
RAILWAY, LOCOMOTIVE CAR PARTS, NES (731.7)	.139696	.144889	.146155
BUSES (732.2)	.045022	.049765	.050816
LORRIES AND TRUCKS (732.3)	.293627	.299900	.301399
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.108367	.115178	.113336
TRACTORS FOR TR-TRAILERS (732.5)	-.056621	-.052540	-.049904
SHIPS AND BOATS (735)	.320728	.327107	.328244
SHIPS AND BOATS NON-WAR (735.3)	.208718	.214550	.215813
SHIPS AND BOATS NES (735.9)	.243997	.250098	.251542

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 2000

	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.163528	.168846	.163709
TOTAL MACHINERY NON-ELECTRIC (71)	.159058	.164354	.165246
POWER GENERATING MACHINERY (711)	.145725	.150962	.151903
BOILER,STEAM GENERATING MACHINERY (711.1)	.099998	.104983	.105924
STEAM ENGINES (711.3)	.270424	.276191	.277015
AIR CRAFT ENGINES (711.4)	.130022	.135100	.136074
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.148168	.153370	.154359
NUCLEAR REACTORS (711.7)	.183082	.188460	.189248
ENGINES,NES (711.8)	.265764	.271513	.272355
AGRICULTURAL MACHINERY (712)	.154263	.159487	.160472
OFFICE MACHINERY (714)	.136202	.141352	.142317
TYPEWRITERS (714.1)	.145962	.151132	.152132
OFFICE MACHINES,NES (714.9)	.106403	.111388	.112354
METAL WORKING MACHINERY (715)	.165881	.171173	.171950
MACHINE TOOLS (715.1)	.174691	.180025	.180805
TEXTILE MACHINERY (717.1)	.180728	.186095	.185881
SKIN,LEATHER WORKING MACHINERY (717.2)	.153097	.158280	.159266

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 2000

	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.133454	.138586	.139550
SPECIAL INDUSTRIAL MACHINERY (718)	.164564	.169884	.170724
PAPER AND PULP MACHINERY (718.1)	.150271	.155477	.156467
PRINTING MACHINERY (718.2)	.157272	.162534	.163298
FOOD PROCESSING MACHINERY (718.3)	.185532	.190934	.191596
CONSTRUCTION, MINING MACHINERY (718.4)	.136973	.142123	.143094
MINERAL AND GLASS WORKING MACHINERY (718.5)	.157641	.162902	.163608
OTHER SPECIAL MACHINERY (719)	.162507	.167820	.169725
HEATING, COOLING EQUIPMENT (719.1)	.155039	.160318	.161265
PUMPS AND CENTRIFUGES (719.2)	.174628	.179994	.180805
MECHANICAL HANDLING EQUIPMENT (719.3)	.174372	.179738	.183608
POWERED-TOOLS, OTHER (719.5)	.093474	.098411	.099083
SPRAYING, VENDING, OTHER MACHINERY (719.6)	.180097	.185485	.186121
BALL, ROLLER BEARINGS (719.7)	.114239	.119282	.120228
MACHINERY AND MECHANICAL APPLIANCES, NES (719.8)	.161081	.166389	.167302
PARTS AND ACCESSORIES OF MACHINERY, NES (719.9)	.149762	.155020	.156043
TOTAL ELECTRICAL MACHINERY (72)	.141911	.147081	.149056

Appendix 8.10

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 2000

	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.140191	.145355	.146331
POWER TRANSFORMING MACHINERY (722.1)	.141307	.146475	.147450
SWITCH GEAR, ETC. (722.2)	.143423	.148603	.149581
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.134550	.139688	.140656
INSULATED WIRE AND CABLE (723.1)	.135907	.141048	.142019
ELECTRIC INSULATED EQUIPMENT (723.2)	.150018	.155230	.156218
ELECTRICAL MACHINERY OTHER (729)	.153838	.159061	.160047
BATTERIES AND ACCUMULATORS (729.1)	.130598	.135712	.136678
ELECTRIC LAMPS (729.2)	.146485	.151675	.152654
VALVES,TUBES, ETC. (729.3)	.170302	.175607	.176618
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.147307	.152565	.153387
MEASURING APPARATUS (729.5)	.231533	.237126	.237942
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.174707	.180046	.180833
OTHER,NES (729.9)	.189370	.194807	.195495
TOTAL TRANSPORT EQUIPMENT (73)	.172019	.177378	.179186
RAILWAY VEHICLES (731)	.071900	.076790	.077522
LOCOMOTIVES, OTHER (731.3)	.234439	.240084	.240964

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 2000

	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (731.5)	.216765	.222232	.222979
RAILWAY, LOCOMOTIVE CAR PARTS, NES (731.7)	.148519	.153708	.154554
BUSES (732.2)	.097395	.102402	.103166
LORRIES AND TRUCKS (732.3)	.230591	.236221	.237096
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.134173	.139298	.140274
TRACTORS FOR TR-TRAILERS (732.5)	-.006457	-.000329	.002093
SHIPS AND BOATS (735)	.242944	.248621	.249328
SHIPS AND BOATS NON-WAR (735.3)	.189218	.194636	.195449
SHIPS AND BOATS NES (735.9)	.204621	.210172	.211071

SOURCE: ECONOMETRIC RESEARCH LTD.

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1985 TO 1990

	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.166003	.169616	.170085
TOTAL MACHINERY NON-ELECTRIC (71)	.165963	.169577	.170060
POWER GENERATING MACHINERY (711)	.163124	.166756	.167260
BOILER,STEAM GENERATING MACHINERY (711.1)	.148995	.154073	.161852
STEAM ENGINES (711.3)	.164914	.168424	.169454
AIR CRAFT ENGINES (711.4)	.143697	.149495	.156513
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.152814	.157840	.165933
NUCLEAR REACTORS (711.7)	.164659	.168746	.168515
ENGINES,NES (711.8)	.182774	.186421	.186791
AGRICULTURAL MACHINERY (712)	.131313	.136536	.143913
OFFICE MACHINERY (714)	.140672	.145897	.153658
TYPEWRITERS (714.1)	.141047	.146088	.153827
OFFICE MACHINES,NES (714.9)	.121771	.128881	.133775
METAL WORKING MACHINERY (715)	.166676	.170383	.171024
MACHINE TOOLS (715.1)	.169275	.173027	.173558
TEXTILE MACHINERY (717.1)	.170190	.173881	.174362
SKIN,LEATHER WORKING MACHINERY (717.2)	.156015	.162711	.171137

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1985 TO 1990

	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.143637	.148952	.156947
SPECIAL INDUSTRIAL MACHINERY (718)	.165444	.169084	.169545
PAPER AND PULP MACHINERY (718.1)	.154491	.159734	.167511
PRINTING MACHINERY (718.2)	.163770	.167839	.168327
FOOD PROCESSING MACHINERY (718.3)	.160231	.163927	.164192
CONSTRUCTION,MINING MACHINERY (718.4)	.142250	.147462	.155203
MINERAL AND GLASS WORKING MACHINERY (718.5)	.155790	.159686	.161353
OTHER SPECIAL MACHINERY (719)	.168136	.171738	.172207
HEATING,COOLING EQUIPMENT (719.1)	.167510	.171113	.171558
PUMPS AND CENTRIFUGES (719.2)	.167325	.170867	.171364
MECHANICAL HANDLING EQUIPMENT (719.3)	.169715	.173223	.173681
POWERED-TOOLS,OTHER (719.5)	.136243	.139981	.140633
SPRAYING,VENDING, OTHER MACHINERY (719.6)	.167844	.171584	.171846
BALL,ROLLER BEARINGS (719.7)	.139164	.144158	.151486
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	.163364	.167037	.167554
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	.171371	.174904	.175398
TOTAL ELECTRICAL MACHINERY (72)	.139401	.144600	.152269

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1985 TO 1990

	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.143636	.148793	.156567
POWER TRANSFORMING MACHINERY (722.1)	.141486	.146669	.154388
SWITCH GEAR, ETC. (722.2)	.145362	.150516	.159254
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.141495	.146667	.154406
INSULATED WIRE AND CABLE (723.1)	.140562	.145673	.153351
ELECTRIC INSULATED EQUIPMENT (723.2)	.155619	.160815	.169613
ELECTRICAL MACHINERY OTHER (729)	.139959	.145165	.152854
BATTERIES AND ACCUMULATORS (729.1)	.136773	.141972	.149574
ELECTRIC LAMPS (729.2)	.147954	.152596	.160543
VALVES, TUBES, ETC. (729.3)	.156005	.160793	.169203
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.165872	.169404	.169739
MEASURING APPARATUS (729.5)	.183387	.186924	.197315
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.175888	.178645	.173892
OTHER, NES (729.9)	.171039	.174742	.175219
TOTAL TRANSPORT EQUIPMENT (73)	.169038	.172614	.173028
RAILWAY VEHICLES (731)	.170350	.173978	.174490
LOCOMOTIVES, OTHER (731.3)	.172638	.176145	.175406

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1985 TO 1990

	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (731.5)	.168781	.172756	.173506
RAILWAY, LOCOMOTIVE CAR PARTS, NES (731.7)	.119078	.120300	.122779
BUSES (732.2)	.104483	.100460	.109191
LORRIES AND TRUCKS (732.3)	.172977	.176504	.175888
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.140374	.145894	.153521
TRACTORS FOR TR-TRAILERS (732.5)	-.034383	-.033068	-.029980
SHIPS AND BOATS (735)	.168818	.172367	.172804
SHIPS AND BOATS NON-WAR (735.3)	.170207	.174093	.174264
SHIPS AND BOATS NES (735.9)	.153745	.157494	.157697

TABLE: GROWTH RATES CALCULATED FROM THE FOFECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1990 TO 2000

	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.169135	.174183	.174533
TOTAL MACHINERY NON-ELECTRIC (71)	.169126	.174174	.174527
POWER GENERATING MACHINERY (711)	.168503	.173555	.173930
BOILER,STEAM GENERATING MACHINERY (711.1)	.162613	.165951	.163540
STEAM ENGINES (711.3)	.168727	.173786	.174165
AIR CRAFT ENGINES (711.4)	.161451	.164830	.162480
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.163555	.166846	.164401
NUCLEAR REACTORS (711.7)	.168912	.173903	.174169
ENGINES,NES (711.8)	.172516	.177526	.177854
AGRICULTURAL MACHINERY (712)	.158003	.161483	.159276
OFFICE MACHINERY (714)	.160508	.163958	.161623
TYPEWRITERS (714.1)	.160541	.164157	.161738
OFFICE MACHINES,NES (714.9)	.155734	.159478	.157508
METAL WORKING MACHINERY (715)	.169233	.174286	.174639
MACHINE TOOLS (715.1)	.169742	.174824	.175178
TEXTILE MACHINERY (717.1)	.169964	.175013	.175367
SKIN,LEATHER WORKING MACHINERY (717.2)	.164310	.167702	.165475

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1990 TO 2000	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.161318	.164669	.162349
SPECIAL INDUSTRIAL MACHINERY (718)	.169009	.174062	.174415
PAPER AND PULP MACHINERY (718.1)	.163935	.167227	.164728
PRINTING MACHINERY (718.2)	.168645	.173695	.174067
FOOD PROCESSING MACHINERY (718.3)	.167850	.172832	.173218
CONSTRUCTION,MINING MACHINERY (718.4)	.160951	.164340	.162003
MINERAL AND GLASS WORKING MACHINERY (718.5)	.166806	.171845	.172315
OTHER SPECIAL MACHINERY (719)	.169596	.174640	.174982
HEATING,COOLING EQUIPMENT (719.1)	.169454	.174500	.174847
PUMPS AND CENTRIFUGES (719.2)	.169407	.174460	.174803
MECHANICAL HANDLING EQUIPMENT (719.3)	.169911	.174956	.175302
POWERED-TOOLS,OTHER (719.5)	.161583	.166810	.167304
SPRAYING,VENDING, OTHER MACHINERY (719.6)	.169391	.174430	.174819
BALL,ROLLER BEARINGS (719.7)	.160161	.163465	.161151
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	.168567	.173621	.173988
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	.170284	.175328	.175659
TOTAL ELECTRICAL MACHINERY (72)	.160200	.163606	.161317

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1990 TO 2000

	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.161293	.164668	.162321
POWER TRANSFORMING MACHINERY (722.1)	.160739	.164125	.161804
SWITCH GEAR, ETC. (722.2)	.161707	.165095	.162714
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.160741	.164143	.161817
INSULATED WIRE AND CABLE (723.1)	.160503	.163885	.161591
ELECTRIC INSULATED EQUIPMENT (723.2)	.164265	.167456	.165001
ELECTRICAL MACHINERY OTHER (729)	.160345	.163747	.161448
BATTERIES AND ACCUMULATORS (729.1)	.159529	.162929	.160655
ELECTRIC LAMPS (729.2)	.162266	.165636	.163254
VALVES,TUBES, ETC. (729.3)	.164170	.167506	.164990
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.169152	.174184	.174512
MEASURING APPARATUS (729.5)	.172599	.177633	.177958
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.171219	.176281	.175403
OTHER,NES (729.9)	.170123	.175160	.175486
TOTAL TRANSPORT EQUIPMENT (73)	.169793	.174839	.175169
RAILWAY VEHICLES (731)	.170047	.175108	.175442
LOCOMOTIVES, OTHER (731.3)	.170591	.175619	.175971

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1990 TO 2000	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (731.5)	.169565	.174567	.175049
RAILWAY,LOCOMOTIVE CAR PARTS, NES (731.7)	.157411	.162595	.163016
BUSES (732.2)	.152393	.157679	.159125
LORRIES AND TRUCKS (732.3)	.170627	.175661	.175971
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.160580	.163939	.161605
TRACTORS FOR TR-TRAILERS (732.5)	.046375	.054758	.056935
SHIPS AND BOATS (735)	.169741	.174777	.175101
SHIPS AND BOATS NON-WAR (735.3)	.170034	.175048	.175426
SHIPS AND BOATS NES (735.9)	.166492	.171521	.171909

SOURCE: ECONOMETRIC RESEARCH LTD.

APPENDIX 9

"OFF-TREND" GROWTH RATES CALCULATED FROM
THE FORECAST OF THE APPARENT DEMAND FOR
CAPITAL GOODS FOR INDONESIA
(BASED ON CONSTANT US DOLLAR)
(SEE TABLE III.3)

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1985

	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.183389	.198454	.203031
TOTAL MACHINERY NON-ELECTRIC (71)	.169073	.183984	.194733
POWER GENERATING MACHINERY (711)	.122680	.136862	.147018
BOILER,STEAM GENERATING MACHINERY (711.1)	-.057290	-.049772	-.049986
STEAM ENGINES (711.3)	.700213	.722008	.737129
AIR CRAFT ENGINES (711.4)	.056902	.064399	.068873
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.113496	.122532	.123272
NUCLEAR REACTORS (711.7)	.224931	.231110	.231110
ENGINES,NES (711.8)	.646789	.669607	.689342
AGRICULTURAL MACHINERY (712)	.170083	.178838	.179699
OFFICE MACHINERY (714)	.084837	.093097	.093803
TYPEWRITERS (714.1)	.122166	.130472	.131493
OFFICE MACHINES,NES (714.9)	.000079	.005288	.007853
METAL WORKING MACHINERY (715)	.204807	.220568	.231171
MACHINE TOOLS (715.1)	.238136	.254417	.265549
TEXTILE MACHINERY (717.1)	.263293	.279974	.291377
SKIN,LEATHER WORKING MACHINERY (717.2)	.128136	.135322	.135322

Appendix C.1

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1985	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.070103	.078339	.079816
SPECIAL INDUSTRIAL MACHINERY (718)	.194276	.209493	.219505
PAPER AND PULP MACHINERY (718.1)	.119314	.128175	.129335
PRINTING MACHINERY (718.2)	.173204	.188571	.198873
FOOD PROCESSING MACHINERY (718.3)	.283961	.300200	.307845
CONSTRUCTION,MINING MACHINERY (718.4)	.085456	.093839	.094600
MINERAL AND GLASS WORKING MACHINERY (718.5)	.235059	.250933	.262951
OTHER SPECIAL MACHINERY (719)	.178000	.193125	.204646
HEATING,COOLING EQUIPMENT (719.1)	.148093	.162791	.174393
PUMPS AND CENTRIFUGES (719.2)	.226172	.241822	.252226
MECHANICAL HANDLING EQUIPMENT (719.3)	.222873	.238618	.250648
POWERED-TOOLS,OTHER (719.5)	-.070960	-.066483	-.065483
SPRAYING,VENDING, OTHER MACHINERY (719.6)	.208003	.214412	.215046
BALL,ROLLER BEARINGS (719.7)	.005287	.013363	.014354
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	.169686	.184333	.195656
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	.130592	.145307	.157866
TOTAL ELECTRICAL MACHINERY (72)	.108629	.117149	.117887

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1985

	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.095819	.104371	.105139
POWER TRANSFORMING MACHINERY (722.1)	.103241	.111786	.112545
SWITCH GEAR, ETC. (722.2)	.105838	.114462	.115345
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.077332	.085659	.085387
INSULATED WIRE AND CABLE (723.1)	.083828	.092284	.093012
ELECTRIC INSULATED EQUIPMENT (723.2)	.116608	.125718	.126771
ELECTRICAL MACHINERY OTHER (729)	.154824	.163699	.164471
BATTERIES AND ACCUMULATORS (729.1)	.069044	.077235	.077968
ELECTRIC LAMPS (729.2)	.114133	.123354	.124051
VALVES,TUBES, ETC. (729.3)	.197292	.207189	.207837
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.079756	.085531	.086671
MEASURING APPARATUS (729.5)	.474542	.495147	.509160
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.231147	.248154	.259997
OTHER,NES (729.9)	.242067	.248776	.249352
TOTAL TRANSPORT EQUIPMENT (73)	.173396	.179884	.180615
RAILWAY VEHICLES (731)	-.181408	-.176943	-.176502
LOCOMOTIVES, OTHER (731.3)	.435147	.442843	.443603

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1985

	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (73_.5)	.364940	.371489	.371489
RAILWAY, LOCOMOTIVE CAR PARTS, NES (73_.7)	.155916	.160693	.160693
BUSES (732.2)	-.016074	-.010554	-.010554
LORRIES AND TRUCKS (732.3)	.419212	.427127	.423111
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.077259	.085286	.085163
TRACTORS FOR TR-TRAILERS (732.5)	-.085277	-.078347	-.073347
SHIPS AND BOATS (735)	.484465	.492497	.493072
SHIPS AND BOATS NON-WAR (735.3)	.240384	.246991	.247493
SHIPS AND BOATS NES (735.9)	.331507	.339073	.340193

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1990	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.196901	.203453	.206876
TOTAL MACHINERY NON-ELECTRIC (71)	.189794	.196311	.199880
POWER GENERATING MACHINERY (711)	.164806	.171180	.174647
BOILER,STEAM GENERATING MACHINERY (711.1)	.040754	.047202	.051160
STEAM ENGINES (711.3)	.433202	.441085	.445355
AIR CRAFT ENGINES (711.4)	.099443	.106129	.110269
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.132984	.140049	.144404
NUCLEAR REACTORS (711.7)	.189927	.195677	.196378
ENGINES,NES (711.8)	.420214	.428133	.432396
AGRICULTURAL MACHINERY (712)	.150535	.157494	.161668
OFFICE MACHINERY (714)	.112404	.119185	.123332
TYPEWRITERS (714.1)	.131567	.138253	.142605
OFFICE MACHINES,NES (714.9)	.059179	.065294	.068961
METAL WORKING MACHINERY (715)	.207558	.214228	.217754
MACHINE TOOLS (715.1)	.225268	.232040	.235638
TEXTILE MACHINERY (717.1)	.238198	.245038	.248670
SKIN,LEATHER WORKING MACHINERY (717.2)	.141991	.148935	.153091

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1990

	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.106259	.113086	.117199
SPECIAL INDUSTRIAL MACHINERY (718)	.202358	.208948	.212057
PAPER AND PULP MACHINERY (718.1)	.136766	.143846	.149265
PRINTING MACHINERY (718.2)	.190509	.197033	.200540
FOOD PROCESSING MACHINERY (718.3)	.243676	.250528	.252207
CONSTRUCTION,MINING MACHINERY (718.4)	.113491	.120330	.124493
MINERAL AND GLASS WORKING MACHINERY (718.5)	.221148	.227866	.232274
OTHER SPECIAL MACHINERY (719)	.195272	.201822	.205721
HEATING,COOLING EQUIPMENT (719.1)	.179685	.186145	.190209
PUMPS AND CENTRIFUGES (719.2)	.218881	.225559	.228703
MECHANICAL HANDLING EQUIPMENT (719.3)	.218459	.225144	.229106
POWERED-TOOLS,OTHER (719.5)	.023896	.028491	.029926
SPRAYING,VENDING, OTHER MACHINERY (719.6)	.183391	.188954	.189678
BALL,ROLLER BEARINGS (719.7)	.070134	.076776	.081747
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	.188406	.194886	.199332
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	.172771	.179212	.183770
TOTAL ELECTRICAL MACHINERY (72)	.123910	.130791	.134948

Appendix 9.6

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1990	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.119472	.126363	.130561
POWER TRANSFORMING MACHINERY (722.1)	.122200	.129093	.133273
SWITCH GEAR, ETC. (722.2)	.125427	.132345	.136597
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.108949	.115746	.119880
INSULATED WIRE AND CABLE (723.1)	.111833	.118660	.122776
ELECTRIC INSULATED EQUIPMENT (723.2)	.135946	.143132	.147501
ELECTRICAL MACHINERY OTHER (729)	.147368	.154395	.158648
BATTERIES AND ACCUMULATORS (729.1)	.102389	.109132	.113195
ELECTRIC LAMPS (729.2)	.130917	.137881	.142151
VALVES,TUBES, ETC. (729.3)	.176468	.183763	.188363
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.117692	.122970	.123944
MEASURING APPARATUS (729.5)	.344174	.351648	.355716
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.224819	.231659	.235205
OTHER,NES (729.9)	.201713	.207366	.208168
TOTAL TRANSPORT EQUIPMENT (73)	.167015	.172494	.173380
RAILWAY VEHICLES (731)	-.024574	-.020022	-.019335
LOCOMOTIVES, OTHER (731.3)	.292568	.298662	.293601

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 1990	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (731.5)	.259235	.264984	.265477
RAILWAY,LOCOMOTIVE CAR PARTS, NES (731.7)	.132889	.138363	.139363
BUSES (732.2)	.038693	.043249	.043917
LORRIES AND TRUCKS (732.3)	.285606	.291663	.292686
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.108367	.115178	.119336
TRACTORS FOR TR-TRAILERS (732.5)	-.071508	-.066814	-.065295
SHIPS AND BOATS (735)	.312510	.318657	.319484
SHIPS AND BOATS NON-WAR (735.3)	.200642	.206267	.207163
SHIPS AND BOATS NES (735.9)	.234490	.240325	.241445

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 2000

	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.209525	.215082	.216105
TOTAL MACHINERY NON-ELECTRIC (71)	.205957	.211497	.212601
POWER GENERATING MACHINERY (711)	.193027	.198507	.199595
BOILER,STEAM GENERATING MACHINERY (711.1)	.099998	.104983	.105924
STEAM ENGINES (711.3)	.323373	.329418	.330469
AIR CRAFT ENGINES (711.4)	.130022	.135100	.136074
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.148168	.153370	.154359
NUCLEAR REACTORS (711.7)	.172210	.177511	.178255
ENGINES,NES (711.8)	.318850	.324880	.325934
AGRICULTURAL MACHINERY (712)	.154263	.159487	.160472
OFFICE MACHINERY (714)	.136202	.141352	.142317
TYPEWRITERS (714.1)	.145962	.151132	.152132
OFFICE MACHINES,NES (714.9)	.106403	.111388	.112354
METAL WORKING MACHINERY (715)	.214909	.220463	.221435
MACHINE TOOLS (715.1)	.223975	.229569	.230546
TEXTILE MACHINERY (717.1)	.230502	.236131	.237115
SKIN,LEATHER WORKING MACHINERY (717.2)	.153097	.158280	.159266

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 2000

	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.133454	.138586	.139550
SPECIAL INDUSTRIAL MACHINERY (718)	.212278	.217844	.218693
PAPER AND PULP MACHINERY (718.1)	.150271	.155477	.155467
PRINTING MACHINERY (718.2)	.206082	.211598	.212565
FOOD PROCESSING MACHINERY (718.3)	.232418	.238071	.238162
CONSTRUCTION,MINING MACHINERY (718.4)	.136973	.142123	.143094
MINERAL AND GLASS WORKING MACHINERY (718.5)	.221467	.227051	.228497
OTHER SPECIAL MACHINERY (718)	.208893	.214447	.215710
HEATING,COOLING EQUIPMENT (719.1)	.200930	.206448	.207822
PUMPS AND CENTRIFUGES (719.2)	.220676	.226284	.227129
MECHANICAL HANDLING EQUIPMENT (719.3)	.220670	.226279	.227541
POWERED-TOOLS,OTHER (719.5)	.084122	.088989	.089615
SPRAYING,VENDING, OTHER MACHINERY (719.6)	.168982	.174310	.175015
BALL,ROLLER BEARINGS (719.7)	.114239	.119282	.120228
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	.204945	.210484	.212066
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	.197772	.203275	.204892
TOTAL ELECTRICAL MACHINERY (72)	.141911	.147081	.149056

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 2000

	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.140191	.145355	.146331
POWER TRANSFORMING MACHINERY (722.1)	.141307	.146475	.147450
SWITCH GEAR, ETC. (722.2)	.143423	.148603	.149581
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.134550	.139688	.140656
INSULATED WIRE AND CABLE (723.1)	.135907	.141048	.142019
ELECTRIC INSULATED EQUIPMENT (723.2)	.150018	.155230	.156218
ELECTRICAL MACHINERY OTHER (729)	.153838	.159061	.160047
BATTERIES AND ACCUMULATORS (729.1)	.130598	.135712	.136678
ELECTRIC LAMPS (729.2)	.146485	.151675	.152654
VALVES, TUBES, ETC. (729.3)	.170302	.175607	.176618
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.135744	.140951	.141707
MEASURING APPARATUS (729.5)	.283089	.288955	.289979
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.224290	.229893	.230870
OTHER, NES (729.9)	.178346	.183722	.184450
TOTAL TRANSPORT EQUIPMENT (73)	.161033	.166332	.167100
RAILWAY VEHICLES (731)	.061698	.066531	.067208
LOCOMOTIVES, OTHER (731.3)	.222224	.227823	.229636

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1980 TO 2000	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (731.5)	.206768	.212180	.212854
RAILWAY, LOCOMOTIVE CAR PARTS, NES (731.7)	.137138	.142330	.143013
BUSES (732.2)	.086633	.091574	.092250
LORRIES AND TRUCKS (732.3)	.219037	.224603	.225424
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.134173	.139298	.140274
TRACTORS FOR TR-TRAILERS (732.5)	-.082008	-.072560	-.064648
SHIPS AND BOATS (735)	.231320	.236930	.237675
SHIPS AND BOATS NON-WAR (735.3)	.177962	.183312	.184065
SHIPS AND BOATS NES (735.9)	.191816	.197303	.198152

SOURCE: ECONOMETRIC RESEARCH LTD.

TABLE! GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1985 TO 1990

	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.210567	.208473	.204726
TOTAL MACHINERY NON-ELECTRIC (71)	.210883	.208766	.205048
POWER GENERATING MACHINERY (711)	.208512	.206534	.202941
BOILER,STEAM GENERATING MACHINERY (711.1)	.148995	.154073	.161852
STEAM ENGINES (711.3)	.208124	.205992	.202589
AIR CRAFT ENGINES (711.4)	.143697	.149495	.156513
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.152814	.157840	.165933
NUCLEAR REACTORS (711.7)	.155923	.161263	.162626
ENGINES,NES (711.8)	.224812	.221584	.217413
AGRICULTURAL MACHINERY (712)	.131313	.136536	.143913
OFFICE MACHINERY (714)	.140672	.145897	.153658
TYPEWRITERS (714.1)	.141047	.146088	.153827
OFFICE MACHINES,NES (714.9)	.121771	.128881	.133775
METAL WORKING MACHINERY (715)	.210315	.207921	.204483
MACHINE TOOLS (715.1)	.212535	.210061	.206434
TEXTILE MACHINERY (717.1)	.213600	.211055	.207374
SKIN,LEATHER WORKING MACHINERY (717.2)	.156015	.162711	.171137

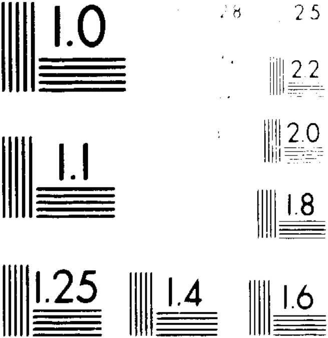
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TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1985 TO 1990

	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.143637	.148952	.156947
SPECIAL INDUSTRIAL MACHINERY (718)	.210494	.208403	.204655
PAPER AND PULP MACHINERY (718.1)	.154491	.159734	.167511
PRINTING MACHINERY (718.2)	.208069	.205556	.202209
FOOD PROCESSING MACHINERY (718.3)	.204654	.202753	.198936
CONSTRUCTION,MINING MACHINERY (718.4)	.142250	.147462	.155203
MINERAL AND GLASS WORKING MACHINERY (718.5)	.207394	.205224	.202342
OTHER SPECIAL MACHINERY (719)	.212798	.210582	.205796
HEATING,COOLING EQUIPMENT (719.1)	.212146	.209968	.206237
PUMPS AND CENTRIFUGES (719.2)	.211633	.209508	.205621
MECHANICAL HANDLING EQUIPMENT (719.3)	.214062	.211817	.207936
POWERED-TOOLS,OTHER (719.5)	.128437	.133128	.134086
SPRAYING,VENDING, OTHER MACHINERY (719.6)	.159280	.164029	.164841
BALL,ROLLER BEARINGS (719.7)	.139164	.144158	.151486
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	.207426	.205533	.202013
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	.216524	.214122	.210254
TOTAL ELECTRICAL MACHINERY (72)	.139401	.144600	.152269

TABLE1 GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1985 TO 1990

	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.143636	.148793	.156567
POWER TRANSFORMING MACHINERY (722.1)	.141486	.146669	.154388
SWITCH GEAR, ETC. (722.2)	.145362	.150516	.159254
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.141495	.146667	.154406
INSULATED WIRE AND CABLE (723.1)	.140562	.145673	.153351
ELECTRIC INSULATED EQUIPMENT (723.2)	.155619	.160815	.169613
ELECTRICAL MACHINERY OTHER (729)	.139959	.145165	.152854
BATTERIES AND ACCUMULATORS (729.1)	.136773	.141972	.149574
ELECTRIC LAMPS (729.2)	.147954	.152596	.160543
VALVES, TUBES, ETC. (729.3)	.156005	.160793	.169203
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.156961	.161781	.162496
MEASURING APPARATUS (729.5)	.225333	.221921	.217873
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.218523	.215381	.211862
OTHER, NES (729.9)	.162670	.167329	.169341
TOTAL TRANSPORT EQUIPMENT (73)	.160668	.165150	.166190
RAILWAY VEHICLES (731)	.162308	.166817	.167827
LOCOMOTIVES, OTHER (731.3)	.164153	.168889	.169963

Appendix 6.15

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1985 TO 1990

	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (731.5)	.161715	.166750	.167660
RAILWAY,LOCOMOTIVE CAR PARTS, NES (731.7)	.110322	.116464	.116464
BUSES (732.2)	.096508	.099977	.101387
LORRIES AND TRUCKS (732.3)	.164579	.169058	.170103
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.140374	.145894	.153521
TRACTORS FOR TR-TRAILERS (732.5)	-.057532	-.055137	-.052059
SHIPS AND BOATS (735)	.160474	.165066	.166078
SHIPS AND BOATS NON-WAR (735.3)	.162172	.166873	.168137
SHIPS AND BOATS NES (735.9)	.144542	.148859	.149974

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1990 TO 2000

	LOW	MED	HIGH
TOTAL ENGINEERING PRODUCTS (7)	.222283	.226823	.225404
TOTAL MACHINERY NON-ELECTRIC (71)	.222340	.226875	.225457
POWER GENERATING MACHINERY (711)	.221931	.226471	.225074
BOILER,STEAM GENERATING MACHINERY (711.1)	.162613	.165951	.163540
STEAM ENGINES (711.3)	.221961	.226404	.224715
AIR CRAFT ENGINES (711.4)	.161451	.164830	.162480
OTHER INTERNAL COMBUSTION ENGINES (711.5)	.163555	.166846	.164401
NUCLEAR REACTORS (711.7)	.154757	.159621	.160406
ENGINES,NES (711.8)	.224722	.229092	.227386
AGRICULTURAL MACHINERY (712)	.158003	.161483	.159276
OFFICE MACHINERY (714)	.160508	.163958	.161623
TYPEWRITERS (714.1)	.160541	.164157	.161738
OFFICE MACHINES,NES (714.9)	.155734	.159478	.157508
METAL WORKING MACHINERY (715)	.222305	.226730	.225126
MACHINE TOOLS (715.1)	.222683	.227104	.225475
TEXTILE MACHINERY (717.1)	.222855	.227288	.225667
SKIN,LEATHER WORKING MACHINERY (717.2)	.164310	.167702	.165475

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1990 TO 2000	LOW	MED	HIGH
SEWING MACHINERY (717.3)	.161318	.164669	.162349
SPECIAL INDUSTRIAL MACHINERY (718)	.222279	.226806	.225365
PAPER AND PULP MACHINERY (718.1)	.163935	.167227	.164728
PRINTING MACHINERY (718.2)	.221859	.226340	.224710
FOOD PROCESSING MACHINERY (718.3)	.221261	.225739	.224275
CONSTRUCTION,MINING MACHINERY (718.4)	.160951	.164340	.162003
MINERAL AND GLASS WORKING MACHINERY (718.5)	.221785	.226238	.224731
OTHER SPECIAL MACHINERY (719)	.222668	.227204	.225782
HEATING,COOLING EQUIPMENT (719.1)	.222558	.227099	.225695
PUMPS AND CENTRIFUGES (719.2)	.222475	.227009	.225556
MECHANICAL HANDLING EQUIPMENT (719.3)	.222885	.227414	.225977
POWERED-TOOLS,OTHER (719.5)	.147890	.153045	.153883
SPRAYING,VENDING, OTHER MACHINERY (719.6)	.154749	.159847	.160532
BALL,ROLLER BEARINGS (719.7)	.160161	.163465	.161151
MACHINERY AND MECHANICAL APPLIANCES,NES (719.8)	.221713	.226287	.224935
PARTS AND ACCESSORIES OF MACHINERY,NES (719.9)	.223306	.227829	.226391
TOTAL ELECTRICAL MACHINERY (72)	.160200	.163606	.161317

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1990 TO 2000	LOW	MED	HIGH
ELECTRICAL POWER MACHINERY (722)	.161293	.164668	.162321
POWER TRANSFORMING MACHINERY (722.1)	.160739	.164125	.161804
SWITCH GEAR, ETC. (722.2)	.161707	.165095	.162714
EQUIPMENT FOR DISTRIBUTING ELECTRICITY (723)	.160741	.164143	.161817
INSULATED WIRE AND CABLE (723.1)	.160503	.163885	.161591
ELECTRIC INSULATED EQUIPMENT (723.2)	.164265	.167456	.165001
ELECTRICAL MACHINERY OTHER (729)	.160345	.163747	.161448
BATTERIES AND ACCUMULATORS (729.1)	.159529	.162929	.160655
ELECTRIC LAMPS (729.2)	.162266	.165636	.163254
VALVES,TUBES, ETC. (729.3)	.164170	.167506	.164990
AUTOMOTIVE ELECTRICAL EQUIPMENT (729.4)	.154087	.159219	.159751
MEASURING APPARATUS (729.5)	.224780	.229169	.227430
ELECTRO-MECHANICAL HAND TOOLS (729.6)	.223762	.228130	.226551
OTHER,NES (729.9)	.155433	.160541	.161199
TOTAL TRANSPORT EQUIPMENT (73)	.155082	.160202	.160853
RAILWAY VEHICLES (731)	.155601	.160728	.161387
LOCOMOTIVES, OTHER (731.3)	.155709	.160848	.161546

TABLE: GROWTH RATES CALCULATED FROM THE FORECAST OF THE APPARENT DEMAND FOR CAPITAL GOODS FOR INDONESIA

1990 TO 2000	LOW	MED	HIGH
PASSENGERS: RAILWAY, TRAMWAY CARS (731.5)	.156487	.161580	.162419
RAILWAY, LOCOMOTIVE CAR PARTS, NES (731.7)	.141403	.146311	.147681
BUSES (732.2)	.136786	.142137	.142821
LORRIES AND TRUCKS (732.3)	.155914	.161024	.161662
SPECIAL PURPOSE LORRIES, TRUCKS AND VANS (732.4)	.160580	.163939	.161605
TRACTORS FOR TR-TRAILERS (732.5)	-.092390	-.078271	-.064000
SHIPS AND BOATS (735)	.155152	.160268	.160938
SHIPS AND BOATS NON-WAR (735.3)	.155710	.160795	.161409
SHIPS AND BOATS NES (735.9)	.150617	.155774	.156368

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INDONESIA INDUSTRY SECTOR STUDY *

UC/INS/82/106

INDONESIA

Part V Potential for Development of a Selective Capital Goods Industry

Prepared by the

Regional and Country Studies Branch
Division for Industrial Studies

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The UNIDO INDONESIA INDUSTRY SECTOR STUDY comprises the following six parts:

Part I	Main Report
Part II	Industrial Development in Indonesia - Past Trends and Future Prospects
Part III	Survey of Capital Goods and Engineering Industries
Part IV	Long-Term Projections of Demand for Capital Goods in Indonesia
Part V	Potential for Development of a Selective Capital Goods Industry
Part VI	Capital Goods Production in Developing Countries: International Experience

THIS DOCUMENT CONTAINS PART V.

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Part V. POTENTIAL FOR DEVELOPMENT OF A SELECTIVE CAPITAL GOODS INDUSTRY

Chapter I Introduction

The Government of Indonesia, within the context of planning further development of capital goods production during Repelita IV, has requested UNIDO to report specifically on the potential for domestic production of equipment for the following in industries:

1. Coconut and palm oil
2. Rubber
3. Sugar
4. Cocoa, coffee, tea
5. Wood
6. Cement
7. Textiles

UNIDO was asked to address the following questions: Which engineering industries within this group could be developed relatively easily and why? Which types of equipment could be produced domestically, how, where and by whom? Could examples of (say) 25 projects be given which would be promising candidates for promotion? What sub-sectoral, feasibility studies or other follow-up studies would be required? Part V of this report takes up these questions.

It should be said at the outset that, for lack of data and time, only very tentative and partial answers can be given to these questions at this stage. On many relevant and indeed essential aspects, even of the present situation in Indonesia, the required statistical data have not been available or have proved inadequate.

This applies, for example, to aspects of current production of the products of the equipment using industries, such as sugar, textiles or wood processing. It also applies to the degree of capacity utilisation of existing plant in these industries, the effective reserve capacity and the technical and economic efficiency of the equipment in use. It applies equally to the sources of equipment at present in use, whether imported (e.g. from which countries or firms) or domestically produced (where and by whom). It applies even more to the information needed to make projections of future output, and hence capital requirements, of these industries. In general, Repelita IV target figures have been taken as the starting point where such figures have been available. The Repelita IV period 1984-89 has also been taken as the investment planning period. But it needs to be recognized that production of equipment in most cases is unlikely to become effective before Repelita V especially where prior investment in production capacity is needed.

Adequate assessment of the potential for future domestic production of equipment for these industries requires detailed knowledge of current technology and expert assessment of technological trends. Every effort has been made to draw on the experience and specialised expertise of international equipment supplying companies in developing countries to make the best possible judgements, but such matters are clearly subject to much uncertainty.

Finally, and most serious of all, hardly any of the economic data are available which are needed to assess whether domestic production of the many hundreds of items of equipment would not merely be technically possible in Indonesia but would also be economic, in the sense of not requiring very high rates of effective protection from import competition (by tariffs, subsidies or controls) with consequent economic burdens on the Indonesian user industries.

The data needed are, in effect, those required for a cost-benefit analysis of the establishment of any one of the potential equipment producing industries under consideration. Among these data are the price at which a particular piece of equipment (of adequate quality) could be produced in Indonesia as compared with the price at which it can be imported; the components of investment costs for plants of different size, alternative technologies and alternative locations; the size of the domestic market for each type of equipment (and potential export market, e.g. under regional complementation arrangements within ASEAN) that can be expected over the next (say) decade which, in turn, depends on such factors as the likely growth of demand for the finished product (rubber, sugar, etc.), the degree of capacity utilisation and likely rate of replacement demand for existing equipment and the likely rate of obsolescence due to technical change.

It will be apparent that the detailed analysis needed to answer the questions posed in the terms of reference for this study not only presented major data problems but also an analytical task which could not be attempted in the few man months available. In general, the discussion in the industry chapters focuses on technical feasibility. (At various points, to emphasize this fact, the phrase that production of such and such an item is or may be "technically" possible in Indonesia has been used). All recommendations for the establishment or expansion of equipment producing facilities in this report should therefore be regarded as provisional, subject to confirmation by means of detailed sub-sectoral studies of economic, as contrasted with merely technical, feasibility.

The next two chapters present a brief review of theoretical criteria for selection of industries for domestic equipment production and a report of impressions on the present state of the Indonesian equipment producing industry found by a UNIDO mission during field work in October - November 1983. The industry chapters deal each with one of the selected industries except the first which deals jointly with coconut and palm oil. A concluding chapter brings together the main findings and recommendations.

The next two chapters deal respectively with selection criteria for local production and with the present condition of equipment production in Indonesia. Then follow seven industry studies. For ease of reference, each of these has as far as possible the same structure, as follows:

X.1 Raw material production (e.g. sugar, natural rubber)
- X.1.1 The present situation
- X.1.2 Future prospects

X.2 Processing
- X.2.1 Processing technology
- X.2.2 Processing equipment
- X.2.3 The processing industry

X.3 Equipment Production (in Indonesia)
- X.3.1 The present situation
- X.3.2 Future prospects

X.4 Investment implications

X.5 Recommendations

Chapter II Criteria for Selection:

Most of this part of the report is devoted to an examination of the potential for development of domestic production in Indonesia of equipment for a number of industries which the Government of Indonesia has suggested to UNIDO as most appropriate in terms of economic and technical criteria. The purpose of this preliminary chapter is briefly to review the criteria that must guide policy makers in planning future development of processing and processing equipment producing industries.

2.1 Processing Industries

Indonesia already has a wide range of industries processing domestically produced raw materials. Among them are industries processing foodstuffs (such as rice, other staple foods, and cash crops including sugar, tea, coffee, etc.); agricultural raw materials, such as rubber, palm oil; timber; crude oil and minerals.

Processing may be for export or for the domestic market. If raw materials are at present exported in unprocessed form, a policy of further domestic processing before export is called "export substitution". If a domestically produced raw material is processed abroad for reimport into Indonesia in processed form (e.g. crude oil refined in Singapore or rubber processed abroad for import into Indonesia of the processed product), a policy of domestic processing implies import substitution.

The question whether export or import substitution through the establishment of additional processing industries is desirable depends on the prospects of efficient domestic production. The mere fact that a new industry processes domestically produced raw materials does not, in itself, prove that its establishment constitutes a more efficient use of scarce resources than some alternative industrial development. But there is a presumption that import substitution in the case of domestically produced raw materials reimported in processed form will be economic, other things being equal, if only because of saving in transport costs.

In the case of export substitution, there is much less ground for such presumption. The question whether further processing (e.g. mineral smelting or rubber processing) at home of products intended for export is an economic use of resources cannot be answered a priori. If the domestic processing industry can be made to operate more efficiently (in terms of costs and quality) than the foreign processing industry it replaces, the domestic export industry will benefit by improved international competitiveness. If it operates less efficiently, the domestic export industry will suffer. Even in terms of net foreign exchange saving, the effect on the balance of payments may be negative. (An example is import replacement in shipping, if the net effect is higher freight charges which reduce the competitiveness of the country's export industries.)

2.2 Processing equipment industries

Similar but distinct questions are raised by a policy of import substitution through the domestic production of processing equipment (machinery, etc.). The question is whether an existing (or prospective) processing industry should be supplied with machinery through domestic production instead of imports An example might be domestic production, instead of imports, of crumb rubber plants or rice mills or petroleum refinery equipment.

Clearly, the last example almost certainly rules itself out. Petroleum refinery equipment is extremely capital and technology intensive, beyond the present capacity of domestic production in Indonesia. Any attempt to undertake import substitution in this kind of activity would have extremely adverse effects on the user (refinery) industry.

The case of crumb rubber factories or edible oil processing plants is quite different. Except for some components (such as screw presses and hydraulic systems), crumb rubber factories employ relatively simple kinds of machinery, with no very high requirements in terms of skills, capital or technology. Much the same applies to a good deal, though not all, of the equipment used in processing staple food or cash crops. The great advantage in selecting such processing equipment for import substitution, in preference to other engineering industries, is that by assumption a substantial market exists. A large volume of output is produced in Indonesia by the user industries and most of this output requires machinery-using processing. Future demand prospects depend on the expected rate of growth of demand and productive capacity for products and on the demand for machines for replacement of existing stock in the processing industries.

Here again, it cannot be taken for granted that import replacement will necessarily be an economic proposition. If a new domestic processing-equipment producing industry (e.g. producing rice mills or crumb rubber plants) is uncompetitive with imports in price and/or quality of product and can operate only under cover of considerable tariff or other protection, the effects on the raw material producing (rice or rubber) industries may be diastrous. Conversely, if the new industry is able to adapt its machines knowledgeably to the special requirements of the domestic raw materials and the tastes and needs of (foreign and domestic) markets, it may yield external economies in the agricultural sector.

In general, in a country at Indonesia's present stage of industrial development, prospective volume of demand (depending on prospective productive capacity for the raw material and demand for the processed product) and relatively low requirements in terms of capital, advanced skills and sophisticated technology will be prime criteria in the selection of particular processing equipment industries.

There are some other considerations, often called "developmental" or "social", although economists would prefer to think of them as dynamic or involving externalities, which may reasonably modify conclusions reached on the basis of the preceding criteria.

There are, first, the external economies which may be yielded by the development of new industries in a developing country. These may take the form of widening of the market for complementary inputs, for infrastructure and, through the additional income generated, for finished goods. They may also include the favourable effects on skills of management and workers which are sometimes referred to by the phrase "learning by doing". There is no doubt that such externalities may justify, from a longer-term social point of view, investment that would not appear economic in the short-run or attractive to private investors. But the uncertainty of such external effects, and the virtual impossibility of quantifying them, make reliance on them as a guide to investment decisions dangerous - at best an act of faith, at worst an excuse for malinvestment of scarce capital and protection of vested interests.

Secondly, it is arguable that domestic capital goods production in a developing country, such as Indonesia, may help overcome the difficulty that most modern machinery is made in advanced industrial countries, designed primarily with a view to their factor proportions and available skills, and may be unsuited to the very different conditions of developing countries. In principle, domestic production could aim at producing machinery of a simpler kind, embodying a more labour-intensive technology (sometimes called "intermediate" technology) and could develop the skills needed to adapt imported equipment to local conditions. Here again, the case has merit but experience in various parts of the world where attempts have been made to develop "intermediate technology" equipment has not been very convincing. The most efficient "simple" machines for developing countries tend to be produced in advanced industrial countries with the technology and facilities for high-quality, cheap mass production. The case for developing, even at some cost, the skills needed to adapt, maintain and repair imported machinery is much stronger.

Thirdly, it has been argued that equipment producing industries ought to be developed for their employment-creating effects, even if the equipment cannot compete, in quality or price, with imported kinds. This is a dubious and potentially dangerous argument. There is no particular advantage, from the point of view of employment creation, in import substitution for capital rather than consumer goods. Indeed, it can be argued that in the case of consumer goods the costs, in terms of price and quality, of inefficient import substitution for the sake of employment generation merely falls on consumers, while in the case of capital goods it may damage the competitiveness of user industries and end up destroying rather than creating jobs.

Finally, there is the case for the development of equipment producing industries which rests on the potential location of such industries in less developed regions of a country. In Indonesia's case, it can be argued that, if for reasons of transport costs, equipment producing industries for timber, rubber, sugar and cash crop processing industries are economically located near the (processing) user industries on the outer islands, such development can usefully contribute to regional development. This case may have some validity, but here again, it needs to be demonstrated that the user industries (and indirectly the producers of the rubber, cash crops and other raw materials) would not be disadvantaged by such location of equipment production.

Chapter III Indonesia's Present Processing Equipment Industry: Inadequacies and Constraints

Some of the metal working enterprises in Surabaya, Jakarta, Bandung and Medan that are either already producing equipment or spare parts for processing industries or have the potential to do so, were visited by a UNIDO mission in October-November 1983 in order to assess their current capability. The following is a brief outline of the mission's impressions.

Plant and machinery

The most striking impression was that most of the machine tools and other equipment used are very old and of obsolete design. In many machine shops the machines are driven by overhead power shafts. With such machines it is not possible to achieve the necessary tolerances, working accuracies, surface finishes, or rates of metal removal required in the machining and production of components for modern machinery.

The machine shops generally lack the necessary families of machine tools, particularly milling, grinding and boring machines, which are required for their products. The same applies to production machines such as turret lathes, production aids and accessories on machines, and jigs and fixtures . Some of the units had their own foundries. These, however, were also ill equipped. It was evident that investment in machine tools and equipment had been completely neglected over long periods.

Plant layout

The older establishments suffer from very poor layout of the plants which in some cases was designed as long as fifty years or longer ago. In some of the shops the space around the machines was so cluttered with rejected and scrapped parts of which seemed not to have been cleared for years, that it was unsafe to move around. There is clearly inadequate appreciation of the fact that orderly work flow, productivity and costs of handling to a large extent depend on the plant layout.

Production Engineering

With one exception, none of the establishments visited practised production planning or production control. There were no operation layouts accompanying the drawings and components, giving instructions on the selection and size of raw material, sequence of operations, selection of speeds, feeds and depths of cut, tolerances, selection of tooling, jigs and fixtures and machines, etc. Without such instruction proper production of the components and even control of production itself is difficult if not impossible. Nor were there job cards, recording the timing of the operation workers. Without such records it is impossible to arrive at the number of labour hours and machine hours spent on the manufacture of a component or assembly of a group of equipment from which, together with labour and machine hour rates, the costs of production can be ascertained. All these engineering practices are clearly essential for proper financial and production management.

Engineering design

The designs for the equipment were invariably obtained from the foreign contractors of the processing plants. In the case of joint venture establishments, the foreign partner provided the designs which were never altered or modified by the local enterprise. The design personnel often did not know the reason why certain equipment has been designed the way it was. There was not enough time during the mission visits to study design activity in detail. It certainly appeared to be much below that required or normally found in enterprises of similar production activity.

Some of the problems of the user industry were evidently related to design aspects of the equipment. For example, the locally produced furnaces used for burning of sulphur in the sugar processing plants were of ancient design and gave endless trouble. In the same sugar mill a domestically made pump was not functioning because the hydraulic head was too small. The result was frequent breakdowns with production losses. The mission concluded that design capability is a major constraint. Another is lack of standardisation. Equipment is being manufactured to too many different standards depending upon the source of knowhow. The establishment of national standards should be given high priority.

Production processes

Casting. The basic metal forming processes are casting and forging. The mission visited foundries within enterprises in Surabaya, Bandung, Medan, etc. and one modern foundry in Gresik. The captive foundries in the old metal working establishments were ill equipped and turned out rather poor quality castings. There was no sand control or metal control. The rejection rate was very high and at places extremely poor quality castings, which should normally be rejected, were salvaged by welding and used. By contrast, in one of the metal working workshops in Bandung, engaged in the manufacture of boilers and tea processing equipment, the relatively larger size castings required for the tea rolling machines and rotor vane machines were found to be of surprisingly good quality inspite of the fact that the foundry was not properly equipped. This was the result of the work of Metal Industry Development Centre (MIDC) Bandung. The example bears witness to the latent potential of staff and workers and their ability to acquire skills quickly.

The Gresik foundry is a modern foundry with ferrous (including steel) and non-ferrous casting facilities and with automatic sand mixing, moulding, continuous moulding and casting machines. The quality of the castings is good. The foundry is able to make complicated steel castings such as the screw for an oil extraction screw press (prototype). However, its capacity is under-utilised. Utilisation is only about 40 per cent.

There is good potential to improve the quality of castings in various establishments through the efforts of MIDC or its regional branches. There is also ample scope for putting to use the existing underutilised capacity in the modern foundries.

Machining. The quality of machining in general appears to be poor. The main reason is, as already pointed out, the age of the machine tools in these establishments. In one workshop flat surfaces are generated by a very old shaping machine driven by an overhead power shaft, instead of on a milling machine.

The helical grooves on a sugar crushing roll are cut manually by hand grinding wheels. (The grooves look machine cut - the skill of the workers is highly commendable). Except in one establishment manufacturing road roller equipment, the machine tools in all establishments visited in Surabaya and Bandung are old. In Medan, a joint venture enterprise producing boilers and palm oil processing equipment has a good machine shop. Among the lowest quality of machining noticed was a metal working workshop in Medan engaged in making, among other metal fabricated products, some equipment for palm oil extraction plants. The few very old machines tools in use were in open sheds, guideways and spindles sand laden.

It is quite clear that unless new machines are installed in these plants, production of equipment for processing plants of the required quality cannot be expected.

Welding. In most of the shops visited, the quality of welding, both in arc welding and gas welding, is very high. Automatic submerged arc welding is used in the boiler manufacture in a Medan enterprise. The welding done on parts and components required for equipment ranging from simple tanks, bins, hoppers, etc., to low pressure vessels and boilers, appears to be satisfactory and appropriate to the functional requirements of the equipment. It can be said that the skills required for welding in the fabrication of equipment for the processing industries is available in most of the existing establishments.

Quality

The quality of the product in most of the establishments visited was unsatisfactory. Judging by the machine tools and other equipment used in the enterprises, and the lack of any quality control, it was doubtful whether dimensional and form accuracies, tolerances and fits of mating parts were adhered to. The consequences could be observed in the user industry. For example, the digesters in the palm oil extraction process and the screw conveyers and elevators in the kernel recovery station in a palm oil factory were found to be of extremely poor quality. The digester was subject to many breakdowns. The screw conveyers were rickety and far below their functional requirement.

Another deficiency is in the heat treatment, such as hardening, tempering, toughening, required for some of the components. It was noticed that some establishments claim to be able to produce equipment for processing of one or the other product but because they lack basic facilities are in fact producing and supplying products of extremely poor quality. As a result the processing industry, burdened with unproductive machinery, is liable to deteriorate into an inefficient and uneconomic industry, with serious consequences particularly in the export markets.

Management

Management in most of the establishments visited had no systems for production control and cost control. Few had any idea about the cost of production of their products. The product mix was at random. The lack of adequate production management and financial management can adversely affect the long-term development of the equipment manufacturing industry.

Maintenance

In one of the plants visited there was some machine tool reconditioning activity but in the older establishments there was no systematic maintenance of machines. Perhaps the old machines were beyond any maintenance. But, unfortunately, the same attitude was shown towards more recent machines.

Major constraints and requirements

The foregoing discussion of the existing situation highlights the following constraints:

1. Lack of equipment
2. Absence of production engineering (planning and production control) practices
3. Inadequate engineering design capability
4. Inadequate machining skills
5. Absence of quality control
6. Low level of management capabilities (production and financial)
7. Almost complete absence of systematic maintenance.

It is a formidable list. This assessment of the present capability is not meant to conclude that no processing equipment can be or should be domestically produced. The object is to ascertain what is required for efficient domestic production.

Apart from lack of equipment which can be remedied only by new investment, the other technical constraints point to the following requirements:

1. Development of a pool of manpower with adequate engineering skills, for production planning, quality control, etc.
2. Development of design personnel, establishment and application of standards; acquisition and development of tool, jig and fixture design.
3. Development of machinists and line personnei, such as supervisors, foremen, etc.
4. Introduction of quality control systems, including inspection and quality control personnel.
5. Development of higher quality production and financial management.
6. Introduction of maintenance procedures, including preventive maintenance and personnel to carry out maintenance.

Chapter IV Edible Oil Processing Equipment

4.1 Edible oil production

4.1.1 The present situation

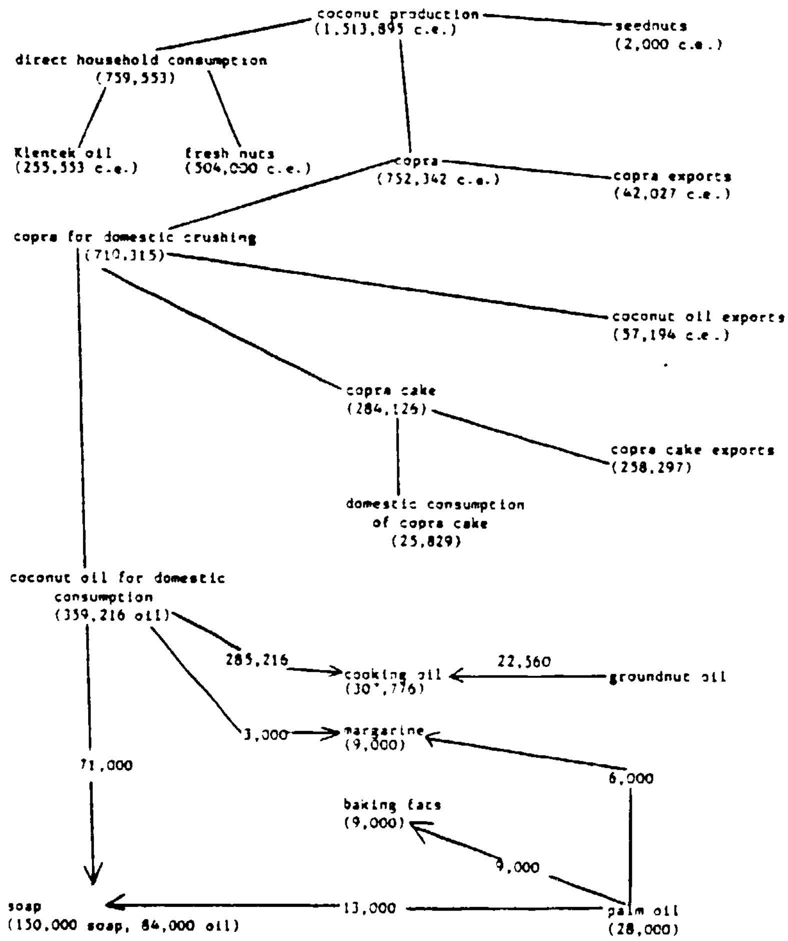
A chart published in 1974 shows schematically (and with data relating to 1972) the complex structure of the Indonesian edible oil industry and the place of coconut and palm oil in this structure (Figure IV.1). Nearly one-half of domestic coconut production went direct into household consumption, in the form of fresh nuts or klentek oil. The other half was processed into copra of which a small proportion was exported as such, the rest domestically processed, partly into copra cake for domestic consumption or export, partly into coconut oil for domestic consumption, in the form of cooking oil, margarine and other cooking fats, soap, etc. Ground nut and palm oil were other inputs for these purposes.

In the past decade, the main change has been a fourfold increase in domestic palm oil production (since 1969), largely for export, while domestic production of coconut has failed to keep up with domestic demand, so that Indonesia has become a net importer. Crude palm oil was expected to become one of the major foreign exchange earners among the country's non-petroleum exports. However, faced with severe shortages of crude palm oil in the domestic market and rising prices, the Government has reversed its policy by clamping down on crude palm oil exports. In the long run the Government is planning to raise coconut oil production channelled primarily for domestic consumption, thus freeing more crude palm oil for export markets. It is against this background that the present situation and future prospects of the edible oil industry must be viewed.

Coconut Growing. Indonesia is the second largest coconut producer in the world (after the Philippines) with 2.2 million ha. Smallholders account for virtually all (98 per cent) of total production.

After decades of failure to replace aging trees (Table IV.1) and consequent decline in yields - the current national average yield is less than one ton per ha - the Government has embarked on a rejuvenation-replanting

Figure IV.1
Coconut Disposition 1972
(based on household consumption survey data)
(tons)



c.e.= copra equivalent

Source: Bulletin of Indonesian Economic Studies, November 1984.

programme with an annual goal of 35,000 ha. For successful replanting, coconut varieties are needed that are hardy and tolerant of a wide range of environmental conditions and give satisfactory yields (2-4 tons of copra per ha per year with low inputs). The coconut breeding programme has developed varieties with these characteristics.

Table IV.1: Ages of Indonesian coconut palms

Age (years)	Palm numbers (million)	%
Under 7	24	11
8 - 60	166	72
Over 60	39	17

Source: Department of Agriculture.

In addition to experimentation with new strains, there is need for a large production of coconut seed varieties. Since the life cycle of coconut is long, testing of strains and seed production should run simultaneously. Four seed gardens (490 ha) have been planted for mass production of seed (Table IV.2).

Table IV.2: Coconut seed gardens and selected seed production

Location	Seed production in '000 of nuts		
	Dwarf x Tall	Tall x Tall	Total
Pakuwon, West Java	642	251	893
Paniki, N. Sulawesi	520	390	910
Bone Bone, S. Sulawesi	952	342	1,294
Paya Gajah, Aceh	445	192	637
Total	2,559	1,175	3,734

Source: Department of Agriculture.

Coconut processing. With declining yields of the existing stands of copra palms and long lags before the rejuvenation programme can show results, production of copra and coconut oil has been outstripped by domestic demand. This has changed Indonesia from being a substantial exporter in 1970 (185,000 tons) to that of a net importer. In 1980, the diversion of palm oil to the domestic market allowed some 19,000 tons of copra to be exported, and some results of replanting are now beginning to show. But the increase in output continues to be fully absorbed by the domestic market; there were no exports in 1981 and 1982. Copra production over the years 1975-81 is shown in Table IV.3. (The figures for crude and refined coconut oil equivalents are based on an assumed yield of 55 per cent for the extraction of oil from copra and 94 per cent for the refining of the crude oil). Exports of copra cake amounted to 317,000 tons in 1979. Total employment in coconut oil refining in 1981 was 5,428 in 99 establishments producing a value added of about Rp. 256 thousand million.

Table IV.3: Production of copra 1975-1981
('000 tons)

Year	Production of Copra	Crude coconut oil equivalent	Refined coconut oil equivalent
1975	1,375	756	711
1976	1,532	843	792
1977	1,518	835	785
1978	1,575	866	814
1979	1,582	870	818
1980	1,759	967	909
1981	1,812	997	937

Source: Quarterly Economic Review Indonesia Annual Supplement, 1983 Economic Intelligence Unit, London.

Palm oil growing. Indonesia's palm oil industry consists of large estates. By 1981, the total area covered by oil palm estates had risen to almost 290,000 ha. Recent development of the area under oil palm is shown in Table IV.4. The total number of estates is 53. They are concentrated in North Sumatra (more than 90 per cent of total area), the remainder being located in Aceh, Riau, Lampung, West Java and Kalimantan.

Table IV.4: Area development of oil palm plantation, 1977-1981
('000 ha)

Year	Extent	Increase (%)
1977	223	
1978	244	9.5
1979	251	2.4
1980[a]	271	8.3
1981[a]	288	6.2

Source: National Agency for Export Development, Palm Commodity Note - 1979.
a/ Estimates.

Since harvested fresh fruit bunches (FFB) must be processed within a specified time, all estates have a primary processing facility. After extraction the crude oil can be stored without damage for a considerable time and transported to central secondary processing units, but most refineries are also linked with the estates in Indonesia. This fact also determines the structure of the industry. In all cases, plantation and processing are combined in a single company. There were 31 locally owned companies in 1982. The sector is also open for foreign investment, and a number of projects have been initiated as joint ventures under the foreign investment law. All of these are located in the Kampar district of Riau province, and in all cases a state-owned PTP (persero) is the local partner.

Palm oil processing. Palm oil production grew extremely rapidly from 189,000 tons in 1969 to 497,000 tons in 1977. Since then growth has continued at a steady though slower rate (Table IV.5). Gross value of output was Rp. 73.6 billion and value added Rp. 19.2 billion. The proportion of palm oil output exported fell from 85 per cent in 1977 to 25 per cent in 1981 (Table IV.6). The 31 palm oil processing units operating in 1982 have a total capacity of 944,260 tons of refined oil; but the policy change of 1980 led to a fall in output to only 526,926 tons in 1982, since domestic demand did not increase sufficiently to offset the fall in exports.

Table IV.5: Production of palm oil and palm kernel 1977-82
('000 tons)

Year	Palm Oil	Increase (%)	Palm Kernels	Increase (%)
1977	497		92.	
1978	525	5.5	99.	7.7
1979	600	14.3	113.	14.1
1980	691	15.2	121.	6.8
1981	707	2.3	126.	4.4
1982	807	14.1	144	14.3

Source: Economic Indicators, Central Bureau of Statistics, August 1982. 1982 Figures: Quarterly Economic Review of Indonesia, No. 2, 1983, The Economist Intelligence Unit.

Table IV.6: Exports of palm oil and palm oil kernel 1977-1982

Year	Volume ('000 tons)				Value (US $ million)			
	Oil	Kernels	Total	Change	Oil	Kernels	Total	Change
1977	421.0	26.6	447.6		192.8	5.8	198.7	
1978	412.3	7.0	419.3	-6.3%	208.4	1.5	209.8	+5.6%
1979	437.8	30.6	468.4	+11.7%	253.7	11.0	264.7	+26.1%
1980	434.3	32.9	467.2	-0.3%	215.4	8.1	223.5	-15.6%
1981	176.4	23.6	200.0	-57.3%	78.1	4.8	82.9	-62.9%
1982	230.0							

Source: Bank Indonesia, Weekly report No. 1236, dated January 6, 1983. 1982 Figures: Quarterly Economic Review of Indonesia, No.2 , 1983, The Economist Intelligence Unit.

4.1.2 Future prospects

Repelita IV target figures for copra production, exports and consumption over the period 1984-88 are given in Table IV.7. The planned increase by 61 per cent between 1981 and 1988 is reported to be based on the number of seedlings planted in earlier years and the assumed gestation period and production volume of the hybrids planted. Target production of crude coconut oil would leave more than one million tons of copra per year for other uses (Table IV.8).

Table IV.7: Production, exports and consumption of copra 1984-1988
('000 tons)

	1984	1985	1986	1987	1988
Production	2,065	2,177	2,316	2,657	2,914
Exports	378	365	459	649	746
Consumption	1,687	1,882	1,857	2,008	2,168

Source: Directorate General of Multifarious Industries.

Table IV.8: Production of coconut oil and domestic copra residue 1984-1988
('000 tons)

	1984	1985	1986	1987	1988
Coconut oil	374	335	400	412	428
Copra required for above	680	609	727	749	778
Copra left for other consumption	1,007	1,273	1,130	1,259	1,390

Source: Directorate General of Multifarious Industries.

Table IV.9 presents the projected production of refined coconut oil over the period 1984-88. Up to 1986, not all of the crude oil is to be refined; for 1987 the figures balance; beyond 1987, the crude oil deficit for refined oil producton is to be covered from accumulated stocks.

Table IV.9: Production of refined coconut oil and crude oil residue 1984-1988
('000 tons)

	1984	1985	1986	1987	1988
Production of refined oil	277	305	353	387	424
(Crude) coconut oil required for above	295	324	376	412	451
Surplus (deficit) above refinery requirements	79	11	24	-	(-23)

Source: Directorate General of Multifarious Industries.

During Repelita III new oil palm plantations totalling 96,000 ha were planted which will start production during Repelita IV. Crude palm oil output will, it is hoped, more than double from 1984 to 1988 (Table IV.10) and reach more than five times the output of 1982. Most of this crude oil will be available for export, since local consumption is estimated to rise by only about five per cent per annum.

Table IV.10:: Projected production and exports of palm oil, 1984-88
('000 tons)

	1984	1985	1986	1987	1988
Total crude palm oil production	1,230	1,540	1,920	2,500	2,850
Crude palm oil for exports	120	310	650	1,180	1,490
Crude palm oil for domestic processing	1,110	1,230	1,270	1,320	1,360
Refined palm oil for domestic consumption	670	740	760	790	820

Source: Directorate General of Multifarious Industries.

4.2 Processing

4.2.1 Processing technology

The processing of coconut and palm oil proceeds in two stages:

(i) the extraction of oil from copra, palm fruit or kernel (primary processing);
(ii) the refining of the oil (secondary processing).

Primary processing: coconut oil. The first stage of primary processing of coconuts is production of copra. After harvesting, the coconuts are cut into pieces and sun-dried for one day. Drying is then continued in simple kilns of varying design in different regions. Coconut husk or other traditional fuels are used for firing. The kilns are made locally of available wood or bamboo. A normal drier has a batch capacity of 1,000 nuts (moisture content: about 50 per cent) giving after two to three days about 220 kg of copra with 6 per cent moisture content. The investment in the kiln is estimated at US $200 for 100 tons annual dry copra. The quality of copra depends upon the maturity of the nuts, the extent and conditions of drying, the storage and handling conditions and, to some extent, the variety of the coconut palms.

There are three general methods of oil extraction: the full-press or mechanical method, the prepress-solvent method or mechanical-chemical method; and the full-solvent or chemical method. In the full-press method the prepared material is pressed between the screws (worm) and the cage (slitted steel bars). In the prepress-solvent process, the copra is partially de-oiled by preliminary low-pressure mechanical extraction and then subjected to solvent extraction to remove most of the oil left. The oil content of the prepressed cake ranges from 16 to 20 per cent for optimum operations. The equipment used for prepressing may be similar to expellers for full-pressing (with adjustments for higher throughputs) or a special prepressing expeller with single pressing screw. The equipment for solvent extraction consists of two general types: the roto-cell type with cells revolving around a vertical axis; and the basket type, with baskets travelling horizontally, while the dissolving liquid is sprayed over the material in counter-current flow. In the full-solvent process, the prepared copra is first subjected to a first extraction (percolation), using the weak miscella from the second extractor as starting solvent, and producing the strong miscella for oil recovery. The extracted meal is first flaked and then subjected to a second extraction (immersion) which uses fresh solvent as starting solvent and produces the weak miscella solvent for the first extractor.

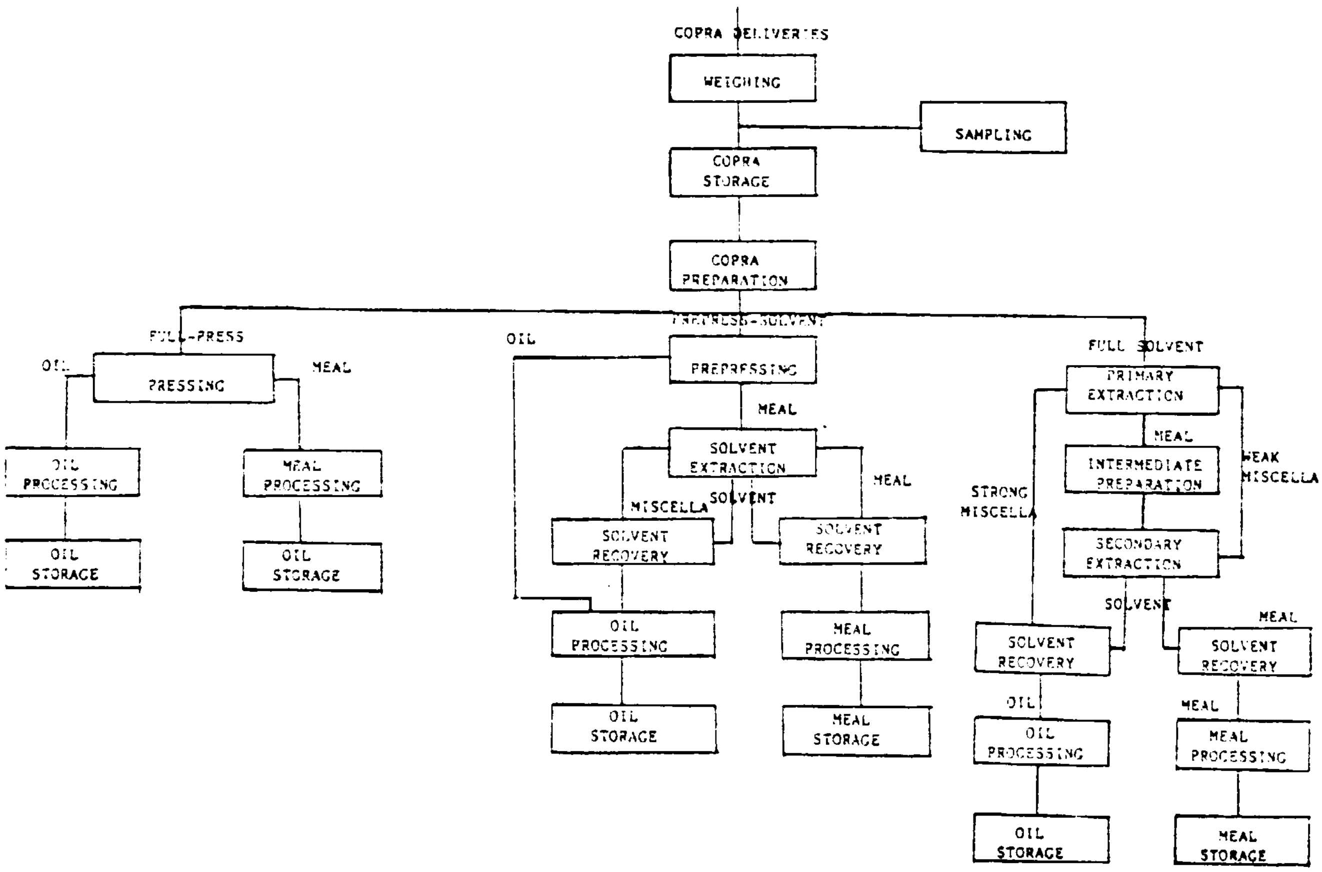
The oil from the expellers contains substantial quantities of solids that have to be removed before the oil is pumped to the storage tanks. The oil is cleaned in two stages: first, by settling and screening, and then by filtration. The screening equipment is a rectangular steel tank equipped with a continuous drag chain conveyor with scraper blades which scoop the settled solids and lift them over a fine screen for drainage at one end of the screening tank and convey them back to the expellers to be mixed with the copra. The filtering equipment is generally a plate and frame filter press with canvass filtering media. Some plants use leaf filters with perforated steel filtering leaves. The foots or filter cake from the filters are recycled to the expellers for oil extraction.

The copra cakes which leave the expellers at about 100°C. are further processed in cake coolers. The cakes cascade down the cooler baffles and are cooled by a cross-flow of cool air from blowers. After cooling they are ground to fine particles by hammer mills or disk mills. The ground cakes may be bagged for the local market or pelletised for export.

The coconut oil is stored in vertical cylindrical storage tanks usually made of steel. Since they are normally installed outside the buildings, they are equipped with covers, usually conical. Top and bottom manholes are provided for cleaning.

The following simplified flow diagram illustrates the stages of processing described in the preceding paragraphs (Figure IV.2).

Figure IV.2: Simplified general flow diagram copra oil extraction



Primary processing: palm oil. Oil-palm cultivation and processing must always be organised together because of the need to process the fruit as soon as possible after harvesting .

In good growing conditions, commercial plantings of oil palm can yield annually up to 32 tons of fresh fruit bunches (FFB) per ha during their 25 year life. There are considerable variations in fruit, oil and kernel owing to climate and soil conditions. Although there are peaks and troughs in fruit production, oil-palm yield throughout the year and a permanent work force and reliable processing facilities are essential.

The initial objective in processing the FFB is to get the saleable products into a stable form in which they can be transported and marketed. Extraction rates of 21 per cent and 4 per cent for refined oil and kernels respectively can be expected from a well-run factory. Recent research has shown that other useful by-products can be recovered from factory residues. Empty bunches are burnt to provide an ash rich in potash that can be used as a fertilizer. Dried fibre and kernel-shell are used for boiler fuel.

At tropical temperatures palm oil is a fluid that, with a little heating, can be pumped into tankers for transport by road, rail and sea. Provided care is taken to avoid excessive exposure to air, heat or impurities, crude palm oil can be stored and transported for several months without its quality deteriorating materially. These characteristics that enable it to be handled easily, have contributed greatly to the popularity of palm oil in world markets.

Kernels are usually packed in polythene-lined hessian sacks and, provided care is taken to ensure that they are not subjected to heat or moisture, can be stored for prolonged periods without undue loss of quality.

It is generally accepted that harvesting is the most important economic and qualitative factor in the processing of fresh fruit bunches (F.F.B.). The standard of ripeness of the bunch to be harvested influences, in turn, both the rate of extraction and the level of free fatty acid (F.F.A.) in the oil extracted. It is of course desirable to achieve the highest possible extraction of oil, while its F.F.A. content should be as low as possible. In practice, these aims conflict, since the riper the fruitlets are on a palm bunch the more easily they become bruised and this in turn causes F.F.A. to develop.

The primary process involves sterilising the F.F.B. for about 70 minutes at a steam pressure of 3 kg/cm^2. This arrests the build-up of the free fatty acid content and loosens the fruit from the bunches. Thereafter, the fruit is stripped from the bunches and stirred into a homogenized mass to rupture the oil-bearing cells. The crude oil is expelled from this mass by presses and passed through a series of cleaning or clarification stages where moisture and other impurities are removed. The residual fibre and nut mixture is passed from the presses through an air column where the nuts are separated prior to cracking for recovery of the kernel.

Secondary processing: edible oils. The main objectives of secondary processing or refining are to turn the crude oil into a bland, neutral, colourless and odourless product that can then be made into consumer goods according to the tastes of the markets to be served. While traditionally the processes for palm oil and coconut oil refining have been different, there is one type of processing which is the same for both: physical refining. An obvious advantage of this process for Indonesia is that it reduces the technological variables in the domestic production of oil refining equipment.

Physical refining is basically a steam distillation process in which crude oil (palm or coconut) is, after degumming but without treatment with alkalis, heated to 250°C under high vacuum. This distils off both fatty acids and odiferous compounds and the heat bleaches the oil.

Fractionation involves the splitting of crude oil into two main fractions. A liquid fraction, olein, and a solid fraction, stearin. The distinction between the two fractions is not a sharp one; much depends on the efficiency of fractionation. Processing is designed to meet the specifications of customers, particularly in regard to cloud and melting points.

4.2.2 Processing equipment

To illustrate the considerable range of equipment needed by the edible oil processing industry, Table IV.11 lists the major items needed by the palm oil extraction industry alone. Similar lists could be given for the coconut oil extraction and the edible oil refining industries.

4.2.3 The processing industry

The installed capacity in the Indonesian coconut oil extraction industry was 853,870 tons per annum in 1980, spread among 379 enterprises. Actual production was only 325,000 tons. The small average capacity per enterprise indicates that a large proportion of the processing units are small-scale. There is also substantial excess capacity. Assuming 80 per cent normal capacity utilisation, production could be raised up to 683,000 tons per annum with existing capacity, equivalent to a copra intake of 1,242,000 tons per annum. Since the volume of copra to be milled over the period 1984-1988 does not exceed 778,000 tons per annum (Table IV.12), it appears that no additional capacity in coconut oil extraction is required during Repelita IV and beyond, until the requirement reaches at least 1 million tons.

Table IV.11: Process equipment required for crude palm-oil extraction

Type of Equipment	Quantitiy
Fruit reception station	
bunch hopper	1
steriliser cages	2
bogies	30
Sterilising station	
horizontal steriliser	2
inspection platform	1
Threshing station	
threshing machine	2
traverse screw conveyor	1
Empty bunch incinerator	
conveyors	2
incinerator	1
Processing station	
elevator and conveying equipment	set
digester	3
screw presses	3
equipment for conveying oil and press cake, screened fibre, crude oil tanks, vibrating screen	set
Clarification station	
continuous oil clarification tank	1
sludge tank	1
sludge separator	2
clarified oil tank	1
centrifuge purifier	2
structurals	set
collecting tank for oil sludge	1
hot process water tank	1
Depericarping	
steam hacketed cake breaker conveyor	1
vertical pneumatic depericarping	1
penumatic fibre transport	1
fibre cyclone	1
ducting	set
structurals	set
Kernel recovery station	
elevators	4
screw convevors	8
silos	4
ducting	-
structurals	-
dryers	1
cyclones	2
Storage	
storage tanks	2
structural, piping, etc.	set

Table IV.12: Production and consumption of vegetable cooking oil, refined coconut and palm oil, 1984-1988
('000 tons)

	1980	1984	1985	1986	1987	1988
Coconut oil						
-production of copra	591	680	609	727	749	778
-crude oil	325	374	335	400	412	428
-crude oil for refining	276	295	324	376	412	451
-refined oil	232	277	305	353	387	424
Palm oil						
-crude oil	533	1,110	1,230	1,270	1,320	1,360
-refined oil	320	670	740	760	790	820
Total refined oil	552	947	1,045	1,113	1,177	1,244
Domestic a/ consumption of cooking oil		812	882	958	1,040	1,129
Surplus		135	163	155	137	115

Source: Computations based upon Tables IV.7 - IV.10.
a/ Based on 1983 consumption of 748,000 and growth rate of 8.6 per cent per annum.

The increase in palm oil extraction capacity required to process the output of newly producing plantations during the period of Repelita IV is shown in Table IV.13.

Table IV.13: Planned increase in crude palm oil processing units (unit capacity: 60 FFB/hr), 1984-1988

Year	Number of New Processing Units	Total investment a/ (in Million US$)
1984	5	37.5
1985	9	67.5
1986	8	60
1987	6	45
1988	4	30

Source: Computations based upon Tables IV.10, 12
a/ Constant prices of 1982/83.

Existing installed capacity for edible oil (coconut and/or palm oil) refining is 282,000 tons per annum in 105 plants. Actual production in 1982 was reported to be 254,000 tons, which implies a very high (90 per cent) capacity utilisation. Additional capacity for 200,000 tons per annum will be required during 1984-88, i.e. installed capacity of 250,000 tons per annum, assuming normal 80 per cent capacity utilisation. Table IV.14 shows the required expansion of installed capacity. Table IV.15 translates these requirements into number of refinery units of various capacities and alternative technologies.

Table IV.14: Additional capacity required for coconut oil refining over period 1984/85
('000 tons per annum)

		1984	1985	1986	1987	1988
Projected production of refined coconut oil		278	305	353	387	424
Existing installed capacity as of 1982	282					
Existing production capacity at 90 % utilisation (1982)	254					
Assume 80 % for future existing production capacity	225					
Additional new production capacity required (incremental)		53	27	48	34	37
Cumulative addition production capacity required		53	80	128	162	199
Additional installed capacity required at 80 % utilisation		66	34	60	43	46
Cumulative additional capacity for refining		66	100	160	203	249

Source: Computation based on data from Directorate General of Multifarious Industries.

Table IV.15: Number of refinery units required, for coconut oil 1984-1988

	1984	1985	1986	1987	1988	Total
	('000 tons per annum)					
Additional refining capacity						
required	66	34	60	43	46	249
rounded off	70	40	60	50	50	270
	(units)					
Alternative number of units						
1. continuous precleaning and bleaching						
50 tons/day(12,500 tons/annum)	6	3	5	4	4	22
100 tons/day(25,000 tons/annum)	3	2	2	2	2	11
2. Physical Refining						
100 tons/day(25,000 tons/annum)	3	2	2	2	2	11

Source: Computation based on data from Table IV.14.

4.3 Equipment production

According to Ministry of Industry data, there is a limited production of coconut processing equipment in Indonesia. In 1980, 40 items of equipment, valued at Rp. 21 million, are reported to have been produced. For the palm oil sector, the field work mission identified seven producers of equipment. Of these, five were in Medan and two in Surabaya. The technology used consisted of manual welding and machining on general purpose machine tools.

Of the seven palm oil equipment producers, only three are capable in principle of acting as general contractors for equipment for crude oil extraction, two in Medan and one in Surabaya. All three need strengthening of their engineering capability in varying degree. In addition, there are four companies acting as sub-contractors, three in Medan and one in Surabaya. Their engineering capability and quality of product, however, are unsatisfactory. Poor quality of machining and finishing are mainly responsible.

None of the following items of equipment for primary processing of palm oil is as yet produced in Indonesia: screw presses, sludge separators, hydrocyclone wear-resistant separator heads, balanced impellers for centrifugal forms, sub-assemblies or components such as variable drive for nut crackers, air heating batteries for nut and kernel drying, hydraulic cylinders and pump for hydraulic door operations in the fruit unloading ramp, dished ends and steriliser doors made from boiler plate, recording and control systems for the steriliser, conveyor belting, idler supports for empty bunch conveyors, agitator arms in digestors, level indicators in the tanks for crude oil.

As to coconut oil extraction, similar data were not obtainable during field work. There has been traditional manufacture of equipment for copra production and also for small and medium scale oil extraction. In view of the similarities in the processes for primary processing of coconut and palm oil, it may be assumed that domestic production (or local content) is at much the same level. This would suggest that some equipment categories, such as hammer mills, filter presses and pellet mills, are still imported.

The equipment for refining, both of palm oil and of coconut oil, is still wholly imported, except for local civil works and some mechanical steel structure components.

4.4 Investment implications

The unit price of domestically produced palm oil extraction machinery and equipment is Rp. 9 billion, equivalent to US $ 7.5 million, for a plant with a capacity of 60 FFB/hour.

The price of a mechanical extraction plant for coconut oil (full-press process) is about US $35,000 for a capacity of four tons of copra per day, US $800,000 for fifty tons per day and US $2.5 million for 250 tons per day. The price of a pre-press solvent extraction plants is about US $2.5 million for 150 tons per day.

The investment cost of equipment for an edible oil refining plant amounts to approximately US $1.3 million for a plant of 100 tons per day capacity (25,000 tons per annum). The auxiliary installations, such as cooling towers, boiler houses, etc. require an additional investment of US $400,000, and for erection and commissioning (say) US $500,000. Thus, total investment for equipment and installation, for a 100 tons per day plant amount to US $2.2 million. A plant of 200 tons per day capacity costs approximately US $3.4 million.

The investment implications of the required expansion of coconut and palm oil processing are therefore as follows:

Coconut oil extraction. No new investment required. Replacement of machinery is estimated at seven per cent of installed capacity (60,000 tons per annum), i.e. approximately five plants of 50 tons per day (12,000 tons per annum) at US $0.8 million or US $4 million a year.

Palm oil extraction. The required annual investment (arithmetic mean value) is US $48 million for new extraction plants. In addition, seven per cent of 994,000 tons per annum have to be replaced annually, giving 66,000 tons per annum capacity or US $45 million. Total, in round figures: US $93 million per year.

Edible oil refining. Eleven new refineries of 100 tons per day capacity will be required. If four refineries of 200 tons per day and three refineries of 100 tons per day capacity are installed during 1984-88, total investment costs, at the previously indicated price, will be 4 x 3.4 + 3 x 2, i.e. US $20 million, or US $4 million annually for new investment. Because of the durability of the plants, the replacement investment is calculated at only four per cent of installed refining capacity of 600,000 per annum, i.e. 24,000 tons per annum or one plant of 100 tons per day, representing in round figures US $2 million. Total investment required for the refining industry is therefore US $6 million a year.

The foregoing estimates suggest that, during Repelita IV, the edible oil (coconut and palm oil) processing industries will require investment in equipment, whether imported or domestically produced, of about US $103 million annually.

4.5 Recommendations

Some crude oil extraction equipment is already produced locally and domestic production of most of the rest may be expected in due course. The situation for refining equipment is different. Some items and components present no major manufacturing problems; the reason why they are not yet produced domestically is lack of engineering capacity and knowhow in this specialised area. Even for crude oil extraction equipment, however, upgrading of the quality of production is extremely important for the equipment using industries.

As in the case of the sugar and cement industries, the key to further development is the establishment of one or more general engineering facilities functioning as general contractors. They would not necessarily themselves produce equipment, but would act as general contractors for local tender and sub-contracting. They should be of the joint venture type, in order to draw on the experience and knowhow of a leading international edible oil refining equipment producer for the high technology involved. Such a joint venture could at the same time cover other areas of edible oil processing, such as ground nut. One of its tasks would be to assist the government in determining the sequence in which additional equipment production should be taken up, whether through sub-contracting or through the establishment of new specialised production units.

Assuming that by 1985 some thirty per cent of refining equipment can be manufactured locally, it should be technically possible to raise the local content gradually by (say) ten per cent a year, giving the following schedule of domestic manufacture of processing equipment:

	Local content %	Annual Value of Refining Equipment Output US $ million
1985	30	1.8
1986	40	2.4
1987	50	3.0
1988	60	3.6

It is assumed that 90 per cent of oil extraction equipment can technically be produced domestically, i.e. US $87 million. Total equipment production for the edible oil sector would therefore be of the order of US $87 million a year. This would represent employment of some 4,000 persons, assuming US $15,000 per employee.

Chapter V Rubber processing equipment

5.1 Raw material production

5.1.1 The present situation

Although synthetic rubber have become increasingly important, natural rubber still has advantages as a raw material because of its versatility and for special applications (e.g. where heat resistance is important) and the steep rise in the cost of synthetic production which followed the oil price increases of the 1970s has improved the competitive position of natural rubber in world markets.

Indonesia is an important producer of natural rubber, with an average share of 25 per cent in world production. It ranks second to Malaysia among rubber producers (Table V.1).

Table V.1: World production of natural rubber, 1978-1981
(000 tons)

Country	1978		1979			1980			1981			Average	
	Vol.	Share %	Vol.	Δ %	Share %	Vol.	Δ %	Share %	Vol.	Δ %	Share %	Δ %	Share %
Malaysia	1,607	43.3	1,617	0.6	41.8	1,600	-1.1	42.1	1,590	-0.6	41.8	-0.4	42.2
Indonesia	885	23.8	964	8.9	24.9	989	2.6	26.1	963	-2.6	25.3	3.0	13.4
Thailand	469	12.6	540	15.1	14.0	510	-5.6	13.4	510	-	13.4	3.2	13.4
Srilanka	156	4.2	153	-1.9	4.0	133	-13.1	3.5	133	-	3.5	-5.0	3.8
Others	597	16.1	593	-0.7	15.3	564	-4.9	14.9	611	8.3	16.0	0.9	15.6
Total	3,714	100.0	3,867	4.1	100.0	3,796	-1.8	100.0	3,807	0.3	100.0	0.9	100.0

Source: FAO Production Yearbook, Directorate General of Estates.

About four-fifths of the area under rubber in Indonesia consists of smallholdings which account for some two-thirds of output (Tables V.2 and V.3). A programme of extension, rejuvenation and upgrading has succeeded in significantly increasing productive capacity. But actual production declined in 1981 and 1982, owing chiefly to a fall in world market price and drought which affected output. The replanting and upgrading programme follows years during which existing stands of rubber trees were allowed to age, so that productivity declined, especially in the smallholder sector, and it will take some years for the programme to become effective in terms of output. Of the large rubber estates, about half (in area and output) are state owned, the other half by private companies. The rejuvenation programme in part takes the form of nucleus estate development, largely promoted and financed by the World Bank, under which new technology is to be transmitted by estates to smallholders in the surrounding region.

Table V.2: Area of rubber plantations in Indonesia, 1978-1982
(000 ha)

Year	Smallholders Estates			Large private estates			Government owned estates			Total		
	Area	Δ %	Share %	Area	Δ %	Share %	Area	Δ %	Share %	Area	Δ %	Share %
1978	1,871	-	80.9	253	-	10.9	189	-	8.2	2,313	-	100.0
1979	1,926	2.9	80.8	271	7.1	11.4	187	1.1	7.8	2,384	3.1	100.0
1980	1,947	1.1	81.7	246	-9.2	10.3	190	1.6	8.0	2,383	-	100.0
1981	1,994	2.4	81.7	244	-0.8	10.0	202	6.3	8.3	2,440	2.4	100.0
1982	1,996	0.1	80.7	245	0.4	9.9	232	14.9	9.4	2,473	1.4	100.0
Average	-	1.6	81.2	-	-0.6	10.5	-	5.4	8.3	-	1.7	100.0

Source: Directorate-General of Estates.

Table V.3: Indonesia's production of natural rubber, 1978-1982
(000 tons)

Year	Smallholders Estates			Large private estates			Government owned estates			Total		
	Area	Δ %	Share %	Area	Δ %	Share %	Area	Δ %	Share %	Area	Δ %	Share %
1978	612	-	69.2	110.1	-	12.3	162.5	-	18.4	885.0	-	100.0
1979	673.1	9.9	69.8	121.3	10.2	12.6	169.6	4.4	17.6	964.0	8.9	100.0
1980	689.1	2.4	69.6	114.5	-5.6	11.6	185.8	9.6	18.8	989.4	2.6	100.0
1981	642.3	-6.8	66.7	127.5	11.4	13.2	193.4	4.1	20.1	963.2	-2.6	100.0
1982	549.1	-14.5	63.8	121.8	-4.5	14.1	190.1	-1.7	22.3	861.0	-10.6	100.0
Average	-	-2.3	67.3	-	2.9	12.8	-	4.1	19.4	-	-0.4	100.0

Source: Directorate-General of Estates.

The rubber which is obtained after the first stages of treatment is ranked in different qualities known as Standard Indonesian Rubber (SIR) with various specifications (Table V.4). While in the past smallholder rubber has tended to be variable and generally low in quality, upgrading, especially in processing, has greatly improved the quality and international marketability of Indonesian rubber.

Table V.4: Standard Indonesian rubber (SIR) with various specifications

Specifications	Qualities				
	SIR-5L	SIR-5	SIR-10	SIR-20	SIR-50
Maximum dirt content (%)	0.05	0.05	0.10	0.20	0.50
Maximum dust content (%)	0.50	0.50	0.75	1.00	1.50
Maximum vaporizer content (%)	1.00	1.00	1.00	1.00	1.00
Plasticity Retention Index					
Consumer limits minimum	60	60	50	40	30
Producer limits minimum	70	70	60	50	40

More than two-thirds of Indonesian natural rubber is exported as crumb rubber and about 20 per cent as rubber smoked sheet (RSS). The share in exports of crepe rubber, latex and other types has been declining, from almost 15 per cent in 1978 to 12 per cent in 1982 (Table V.5). More than two-thirds of rubber exports go to two countries (USA and Singapore), but the share of Singapore has fallen markedly in recent years (from 40 per cent in 1978 to 25 per cent in 1981) while the residual group of "other countries" increased its share from 11 to 23 per cent, a reflection in part of Indonesian efforts to diversify rubber markets (Table V.6). The value of rubber exports declined sharply in 1981 and 1982, on account of both declining production and falling prices, but they have begun to benefit from recovery in the industrial countries.

Table V.5: Volume of rubber exports by kind

(000 tons)

Kind of Rubber	1979		1979			1980			1981			1981			Average	
	Vol.	Share %	Vol.	± %	Share %	Vol.	± %	Share %	Vol.	± %	Share %	Vol.	± %	Share %	± %	Share %
Crumb	568.8	66.0	571.6	0.5	66.4	658.3	15.2	67.4	563.5	-14.4	69.3	579.8	2.9	72.4	1.1	68.3
RSS	167.6	19.7	167.4	-0.1	19.4	191.8	14.6	19.7	163.5	-14.8	20.1	158.8	-2.9	19.8	-0.8	19.7
Crepe	67.7	7.9	72.2	6.6	8.4	60.8	-15.8	6.2	49.9	-17.9	6.2	21.9	-56.1	2.7	-20.8	6.3
Latex	36.9	4.3	27.2	-26.3	3.2	43.9	61.4	4.5	28.1	-36.0	3.5	36.9	31.3	4.6	7.6	4.0
Others	20.5	2.4	22.6	10.2	2.6	21.3	-5.6	2.2	7.7	-63.8	0.9	4.0	-48.1	0.5	-25.3	1.7
Total	861.5	100.0	861.0	-0.1	100.0	976.1	13.4	100.0	812.7	-16.7	100.0	801.4	-1.4	100.0	-1.2	100.0

Source: Central Bureau of Statistics, Export Statistics.

Table V.6: Value of rubber exports by country of destination, 1978-1982
($ US millions)

Country of destination	1973 Vol.	1973 Share %	1979 Vol.	1979 Δ %	1979 Share %	1980 Vol.	1980 Δ %	1980 Share %	1981 Vol.	1981 Δ %	1981 Share %	1981 Vol.	1981 Δ %	1981 Share %	Average Δ %	Average Share %
U.S.A.	264.2	36.9	309.7	17.2	33.1	398.0	28.5	34.2	301.2	-24.3	36.0	256.5	-14.8	42.2	1.7	36.5
Singapore	292.1	40.8	397.2	36.0	42.4	447.4	12.6	38.4	286.7	-35.9	34.3	151.6	-47.1	25.0	-8.5	36.2
Soviet Union	41.7	5.8	48.6	16.5	5.2	72.8	49.8	6.2	67.2	-7.7	8.1	5.9	-91.2	1.0	-8.2	5.2
Japan	22.4	3.1	33.6	50.0	3.6	43.6	48.8	3.7	31.0	-28.9	3.7	20.1	-35.2	3.3	8.7	3.5
West Germany	16.1	2.2	29.3	83.0	3.1	40.2	37.2	3.5	20.7	-48.5	2.5	28.9	37.6	4.8	27.6	3.2
Others	80.0	11.2	118.4	48.0	12.6	163.3	37.9	14.0	129.0	-21.0	15.4	144.2	11.8	23.7	19.2	15.4
Total	716.5	100.0	936.8	30.7	100.0	1,165.3	24.4	100.0	835.8	-28.3	100.0	607.2	-27.4	100.0	-0.2	100.0

Source: Central Bureau of Statistics, Export Statistics.

Indonesia imports small quantities of rubber for its domestic needs (Table V.7). These imports consist mainly of synthetic rubber (43 per cent) and finished goods (32 per cent). Rubber imports have been growing recently at 12 per cent per year. Table V.8 presents statistics of apparent domestic consumption. The sharp fluctuations from year to year clearly reflect stock changes. The growth in domestic demand for natural and synthetic rubber reflects increasing processing capacity in Indonesia for tyres, inner tubes, household goods and office supplies, among others.

Table V.7: Volume of rubber imports by kind, 1978-1982
('000 tons)

Kind of Rubber	1978 Vol.	1978 Share %	1979 Vol.	1979 Δ %	1979 Share %	1980 Vol.	1980 Δ %	1980 Share %	1981 Vol.	1981 Δ %	1981 Share %	1981 Vol.	1981 Δ %	1981 Share %	Average Δ %	Average Share %
Natural Rubber	1.2	4.5	1.2	-	3.8	2.0	66.7	4.7	2.5	25.0	5.3	0.5	-80.0	1.3	2.9	3.9
Synthetic Rubber	11.5	43.2	14.6	27.0	45.6	16.2	11.0	37.8	20.7	27.8	43.6	18.4	-11.1	46.0	13.7	43.3
Finished goods	9.1	34.2	10.2	12.1	31.9	14.6	43.1	34.0	14.5	-0.7	30.5	12.4	-14.5	31.0	10.0	32.2
Others	4.8	18.1	6.0	25.0	18.7	10.1	68.3	23.5	9.8	-3.0	20.6	8.7	-11.2	21.7	19.8	20.5
Total	26.6	100.0	32.0	20.3	100.0	42.9	34.1	100.0	47.5	10.7	100.0	4.0	-15.8	100.0	12.3	100.0

Source: Central Bureau of Statistics, Import Statistics.

Table V.8: Apparent domestic consumption of rubber, 1978 1982 a/
(000 tons)

Year	Production	Imports	Exports	Apparent Consumption a/	%
1978	885.0	26.6	861.5	50.1	-
1979	964.0	32.0	861.0	135.0	169.5
1980	989.4	42.9	976.1	56.2	-58.4
1981	963.3	47.5	812.7	198.0	252.3
1982	861.0	40.0	801.4	99.6	-49.7
Average	-	-	-	107.8	78.4

Source: Directorate General of Estates, Central Bureau of Statistics, Export and Import Statistics.

a/ Apparent consumption = Production + Imports - Exports.

5.1.2 Future prospects

The area under rubber trees has grown in recent years at an average annual rate of 1.7 per cent. Together with the replanting programme and improvement of yields, the expansion of area under rubber should result in a considerable increase in output by 1988 (Table V.9). The Repelita IV target for 1988 is 1.5 million tons. If the world market expands as projected (1983: 3.6, 1985: 5.7 million tons) prospects for Indonesian rubber exports are favourable. Assuming continuation of present trend of imports, domestic absorption will be about 125,000 tons in 1984 and 200,000 tons in 1988.

Table V.9: Production, exports and consumption of natural rubber, projections over 1984-88
('000 tons)

Year	Production	Exports		Consumption
		Volume	Percentage Increase	
1984	1,107	1,022	-	85
1985	1,150	1,057	3.6	93
1986	1,226	1,124	6.4	101
1987	1,350	1,240	10.3	109
1988	1,515	1,397	12.7	118

Source: Directorate General of Estates.

5.2 Processing

5.2.1 Processing Technology

Primary processing. The natural latex obtained by tapping rubber trees consists of water (60-66 per cent), rubber hydrocarbons (30-36 per cent) and minor constituents. (The composition of the latex is affected marginally by type of soil, quality of cone and season of the year.) The rubber is present in the form of discrete micro particles. Fresh latex, flowing from the tree, is almost neutral but tends to coagulate, as enzymatic and bacterial action increases its acidity. For this reason preservatives (expecially ammonia) and bactericides are added as soon as possible after tapping.

The latex is usually stabilised and concentrated before being exported. In order to reduce transport costs, and for easier use, most latex is sold as either centrifugated or creamed latex. The former is produced by treating the fresh latex with a stabilising agent (mainly ammonia, 0.3 per cent) and then passing it through a centrifuge where 80-85 per cent of solids content remains in the concentrate. After centrifugation, the ammonia content is readjusted (0.6 per cent) to ensure good storage. To produce creamed latex, the latex, after desludging (allowing it to remain in an unstirred condition for several days), is treated by adding creaming agents (mainly sodium or ammonium salts). It is then allowed to stand again while it separates in two layers. After the removal of the skin, the concentrate is again agitated, and a second separation takes place. Ammonia is added to the remaining concentrate which is then ready for shipping.

Secondary processing. In the traditional technology which yields slab or smoked sheet, the latex is coagulated in long tanks with removable plates across the width of the tank. The dilute fresh latex is poured into the tank where dilute formic acid is stirred in and the divider plates inserted. After about sixteen hours, the slags of coagulum are removed and passed through smooth moving rolls. The sheets are then allowed to hang, first for a few hours in open air and then for 3-5 days in a drying shed or smoke house where the temperature is regulated at 50-60°C. Historically, wood has been the fuel for drying rubber, and the smoke was thought to have a positive effect. After drying and grading into six different qualities, the smoked sheets are laid up into bales, and squeezed into standard size.

Crumb rubber is a superior method of processing smallholder rubber into a product of better and more uniform quality. The latex is first strained through a sieve made of perforated plate in order to remove impurities such as leaves, bark and dirt, and then diluted with water, so that non-strainable materials such as sand and sludge are allowed to settle. The next step is chemical coagulation, often with the addition of white colouring matter. The rubber is then crumbed in a machine with rotary knives or a pelletiser, then washed, dried, sorted by quality (dirt content being the main criterion), and packed.

Crepe rubber is a product of high quality, and requires high quality latex. It is processed from latex after refining and determining the dry rubber content. Before coagulation, a retarder is added to inhibit discoloration and softening. After coagulation, the substance is passed through a creping machine which consists of two rollers with longitudinal grooves. A shearing and masticating action takes place, exposing new surfaces to washing as water is sprayed over it. Several such machines are used in sequence, sometimes with a smooth rolling machine as the last step in order to get a more uniform surface. The sheets are dried in a shed for five to seven days. The crepe sheets are then sorted in different qualities (white, pale, brown, thin brown, etc.) and packed.

Powdered rubber. This processing technique has not yet been used in Indonesia but it has high potential because of its advantages for further processing. It is therefore briefly described here.

The powdered rubber is a free-flowing granular form of natural rubber with particle size ranging from 1 to 12 mm in diameter. Powdered rubber can be produced by spray-drying latex or by granulating crumb rubber bales. (The uses of powdered rubber produced by spray-drying are limited, mainly to the preparation of rubber solutions for adhesives. This process is used in Malaysia.)[1/] Powdered rubber has the advantages of simpler handling in factories and saving of energy and labour in mixing and compounding. The powdered rubber and the compounding ingredients can be metered into powder mixers and continuously fed to the hoppers of extruders and injection moulding machines. Although at present the use of powdered rubber (mostly synthetic) is quite small (about 1-2 per cent of total use), there is considerable potential for this intermediate product which is ideally suited for automatic processing.

5.2.2 Processing equipment (N.A.)

5.2.3 The processing industry

In 1983, there were 151 enterprises engaged in the manufacture of crumb rubber in Indonesia; of these, 131 were domestic and 20 foreign owned. Total rated capacity was estimated at 1,045,000 tons per annum, but actual production in 1982 was only 580,000 tons, implying a capacity utilisation of only 56 per cent. The condition of equipment is not known, so that effective spare capacity cannot be determined. The 20 foreign companies have installed capacity of 135,000 tons, the domestically owned companies 910,000 tons. Their relative share in output is not known. In 1980, the 151 companies employed 13,000 people.

No corresponding data are available on the rest of the Indonesian rubber processing industry most of which consists of smallholders and small-scale enterprises producing smoked sheet, slab and other traditional products.

Some information is available on the rubber manufacturing industry (ISIC 355) which produces intermediate or finished rubber products. According to this, there were in 1974-75 in total some 450 establishments, of which 115 were government owned, 302 domestic private and the remaining 35 foreign. Total value added was Rp. 38.2 thousand million. The total number of employees was 46,300, of whom 21,600 were in Java and 24,800 on the other islands. The number of establishments rose by 166 during the period 1970-80, employment by 31,250. The industry's share in total manufacturing value added rose from 1.3 per cent in 1971 to 4.8 per cent in 1980.

5.3 Equipment production

Most of the simple equipment, such as tanks, for the traditional methods of rubber processing into smoked sheet and slab is locally produced by traditional methods. It is uncertain whether they give rise to demand for modern manufacturing facilities, or might require technological improvements.

The main equipment for concentrated (centrifuged) latex production is the centrifuge; tanks and packing equipment are also required. The centrifuges have usually been imported from Germany. In view of the technological compexity of these machines, and the declining demand for the product, domestic production is unlikely.

The main categories of equipment used in the crumb rubber process are shredders, washing tanks, conveyors, driers and compactors. Although most of this equipment is fairly simple, none of it is at present manufactured in Indonesia. Most of the equipment for the present plants was originally imported from Great Britain and is now very outdated. Even the spare parts are mostly imported, although some are made locally. If the data on installed capacity and utilisation obtained during field work are correct, greatly increased production could in principle be obtained by higher capacity utilisation, without adding new capacity. However, if the additional production of 68,000 tons of natural rubber in 1984 and 37,000 tons in 1985 (and so on for later years) is going to be derived from new areas distant from the existing crumb rubber plants, new capacity will be required. More precise information is needed to confirm this.

The Government is reported to be planning to install six new crumb rubber plants. Manufacture of machinery for only six units will hardly be economic. Whether there will be sufficient replacement demand for outdated machinery would need to be determined by a field survey of the 151 existing enterprises.

The machines required for <u>crepe rubber</u> production are shredders, tanks, creping machines, driers and compactors. These require medium-size steel castings and considerable machinery, tooling and patterns investment. Here again, demand for the limited number of new units to be installed in Indonesia is unlikely to warrant domestic manufacture. This is the kind of machinery, however, for which the possibility of manufacture for the regional market under ASEAN complementation arrangements may be worth investigating. Driers involve mere fabrication and can be economically manufactured in small quantities. At a later stage, if and when demand expands, domestic manufacture of shredders and crepe mills, with later design models, may be considered.

The new technology of <u>powder rubber</u> processing may prove to be so important for Indonesia that it should be thoroughly analysed in a feasibility study. If domestic manufacture of equipment should prove to be feasible and economic, cooperation with a foreign technology partner would probably be desirable, whether in the form of a joint venture or through a licensing agreement. Local content could be gradually stepped up over the first years of operation. The investment costs for powder rubber production and processing vary according to the final stage of elaboration of the intermediate product. As an indicator of magnitude, total investment cost may be put at US $1,200 per ton of processed rubber powder in the form of strips or granulate blended with additives and ready for end product fabrication. The minimum annual capacity is about 5,000 tons which gives an investment of US $6 million per plant.

5.4 Investment implications (N.A)

5.5 Recommendations

Most of the equipment for the processing of natural rubber is relatively simple and potentially capable of domestic production. However, low capacity utilisation in the present processing establishments and lack of data on replacement requirements preclude any firm recommendations on the economic viability of such local equipment production.

Two further planning efforts are recommended: First, a general screening study to establish exact data on capacity installed and utilised and investment requirements for replacement of old machinery as well as new capacity for the various kinds of rubber processing. Secondly, a feasibility study of powdered rubber processing in Indonesia.

Since five of the ASEAN countries between them account for a very large proportion of world rubber products, rubber processing euqipment of various kinds should be a prime candidate for intra-ASEAN industrial completion arrangements. Production for the wider regional market should certainly improve the prospects for economic viability of equipment production industry.

Chapter VI Sugar processing equipment

6.1 Cane sugar production

6.1.1 The present situation

Although sugar consumption grew by almost 50 per cent between 1976 and 1981, on by about 8.5 per cent per annum (Table VI.1), per capita sugar consumption in Indonesia remains with 14.9 kg/capita among the lowest among the ASEAN countries. Thailand stands at 13.6, while it has reached 25.2 in the Philippines, 36.4 in Malaysia and 50.4 in Singapore (1980).

Sugar production grew from 1.3 million tons in 1976 to 1.9 million in 1981, an average by 8 per cent per annum, however, it could not match the increase in consumption. Preliminayr figures for 1983 indicate likewise a production of 1.9 million tons. Imports doubled between 1976 and 1980 from 202,000 to 400,000 tons. Taking variations in stock into consideration, net consumption stood at 81 per cent in 1981. The value of sugar imports rose from US $108 million in 1976 to US $161 million in 1980 and US $573 million in 1981.

Table VI.1: Sugar consumption in Indonesia, 1976-1981
('000 ton)

Year	Consumption	Production	Import	Commencing Stock	Latest Stock
1976	1,600.4	1,318.4	202.2	327.3	247.5
1977	1,656.0	1,360.4	222.8	247.5	174.7
1978	1,816.7	1,497.0	430.8	174.7	285.8
1979	1,948.4	1,828.5	294.2	285.8	460.1
1980	2,474.9	1,831.7	399.7	460.1	216.6
1981	2,353.6	1,913.3	720.9	216.6	497.2

Source: Directorate General of Estates; Central Bureau of Statistics, Economic Indicators, December 1981. Quoted from: Bank Bumi Daya, March 1983.

Note: Consumption = Production + Import + (Commencing Stock - Latest Stock) - Exports.

The increase in domestic production originate mainly on smallholdings (Table VI.2). While the large plantations increased their production by only about 53,000 tons, the smallholders raised theirs by approximately 54,000 tons from 1976 to 1981 and produced in 1981 three times as much as in 1976. In the same time span they achieved an increase in yield per ha by 12 per cent against a drop of 26 per cent on the large plantations (private plantations: 45 per cent, state owned plantations: 24 per cent). Yet yield per hectare of the large plantations is still twice as high as on the smallholdings. The area under cultivation is shown in Table VI.3.

Table VI.2: Sugar production in Indonesia, 1976-1981
('000 tons)

Year	Plantations			Smallholdings	Total
	PNP/PTP	Private	Total		
1976	900	152	1,052	267	1,318
1977	924	23	1,007	353	1,360
1978	941	71	1,012	485	1,497
1979	1,012	81	1,093	736	1,828
1980	968	114	1,083	749	1,832
1981	988	116	1,104	809	1,913

Source: Directorate General of Estates.
Quoted from: Bank Bumi Daya, March 1983.

Table VI.3: Extent of sugar plantation area, 1976-1981
(in ha)
('000 tons)

Year	Plantations			Smallholdings	Total
	PNP/PTP	Private	Total		
1976	96	21	117	92	209
1977	100	16	116	118	234
1978	121	24	146	102	248
1979	126	26	152	192	343
1980	130	26	155	207	362
1981	139	29	168	244	412

Source: Directorate General of Plantation.
Quoted from: Bank Bumi Daya, March 1983.

Indonesia also produces brown sugar, at an estimated rate of 350,000 - 400,000 tons per annum, and an unspecified amount of sugar from the coconut and aren palms, mostly on a subsistence basis. It is not clear whether these quantities are included in the official statistics for production and consumption in Table VI.1.

6.1.2 Future prospects

Sugar consumption in Indonesia is expected to grow during Repelita IV at a somewhat slower rate than during Repelita III, i.e. at 7.2 per cent per annum. The Government hopes to replace all sugar imports and regain a net export position by 1985; the export quota granted to Indonesia by the International Sugar Conference of 1983 is 70,000 tons per annum. To meet these output targets, a substantial estate extension programme is under way, coupled with construction of new sugar mills, both on the outer islands. Besides extension of area under cane, it is hoped to achieve a steady increase in yields, from 4.65 tons of sugar per ha in 1981 to 6.76 tons in 1988, mainly through improved cultivation and harvesting methods, better seeds and improved juice extraction in the mills. These plans do not include brown sugar production most of which remains on a subsistence basis.

The Repelita IV targets for expansion of area under cultivation and for white sugar production are shown in Table VI.4. It is not clear what accounts for the differences in production and consumption figures between Tables VI.1 and VI.4.

Table VI.4: Projected extension of sugar plantations and sugar production during Repelita IV, 1984-1988

	1984	1985	1986	1987	1988
Area under sugar cultivation					
(000 ha)	277.6	332.3	357.3	367.3	377.3
(Java)	(231.0)	(259.2)	(259.2)	(259.2)	(259.2)
(outside Java)	(46.6)	(73.1)	(98.1)	(108.1)	(118.1)
Production of sugar					
(000 tons)	1,759	2,156	2,331	2,449	2,550
(Java)	(1,569)	(1,814)	(1,814)	(1,814)	(1,814)
(outside Java)	(190)	(342)	(517)	(645)	(736)

Source: Indonesian Sugar Council Secretariat and Economi Indonesia, No. 71, Vol. XIV.

6.2 Processing: sugar mills

There were, in 1983, 58 sugar factories in Indonesia, including 51 government-owned and seven privately owned. The great majority (55) were on Java, only three outside Java (one each in Aceh, Lampung and South Sulawesi). The one in Lampung is a foreign investment enterprise, with a capacity of 4,000 tons of cane per day (TCD) and an output of 80,000 tons of sugar per annum. Since the middle of the past decade, factory rehabilitation has been under way, financed by a World Bank loan of US $50 million to rehabilitate 25 mills. The first stage of this programme is near completion and the second stage is reported two-thirds complete.

Repelita IV targets envisage an increase in production in 1985 over 1984 of nearly 400,000 TCD, of about 175,000 in 1986, 120,000 tons in 1987 and 1988. In other words, some 800,000 tons additional sugar processing capacity will need to be established during Repelita IV. Assuming a standard mill capacity of 4,000 TCD, corresponding to about 76-80,000 tons of sugar per year, this means that twelve new sugar mills will be needed.

The Government in fact plans to build twelve new mills of which six were already under construction in 1983 and one more has been commissioned. All but one of these is on the outer islands, located as follows: four in Sulawesi, two in Lampung, three in North Sumatra and one each in South Kalimantan, Buru Island and West Java. In August 1983, the Investment Coordinating Board announced three projects open for private investment with proposed locations in Kolaka (South Sulawesi), Wolawa (Southeast Sulawesi) and Merauke (Irian Jaya). The capacity of these mills may diverge from the standard 4,000 TCD on which the calculated number of required mills was based, but they are more likely to be larger than smaller. Together with rehabilitation currently under way, these extensions of capacity should suffice to meet future demand and leave a margin for reserve stock increases.

From 1988 onwards, an average of two sugar mills every three years will have to be commissioned to meet projected demand. Besides constructing large-scale sugar mills, the Government is reported to have been considering 200 small-scale sugar plants ("mini-mills") outside Java. These would have a milling capacity of 200 TCD each.

6.3 Equipment production

The seven sugar factories put up for tender in Repelita III were commissioned on the condition that (a) the international equipment supplier cooperate with a domestic engineering and equipment manufacturing company and (b) that a local content of approximately sixty per cent be achieved. These conditions have been fulfilled.

Six companies (three state-owned and three private) are engaged in engineering planning of sugar mills and are producing various kinds of equipment. In the past year or two, they have also begun manufacture, partly under licensing agreements, of more complex machinery, such as centrifuges. One company, with a licensing agreement with a German manufacturer, has already produced forty centrifuges with a local content of about sixty per cent. Another centrifuge producer has a license agreement with an American company. For the next sugar mills to be commissioned, the main contractor is to be an Indonesian company supported by an internationally known sub-contractor. During the next phase of sugar mill construction, a local content, according to estimates by international suppliers, of 70 per cent should be attainable.

With a view to the "mini-mill" programme, one Indonesian company with a foreign partner has built three small open pan sugar pilot plants. The results, however, are said to be unsatisfactory.

A wide range of spare parts is also produced domestically, partly by the often well equipped repair shops of the sugar mills themselves.

6.4 Investment implications

By 1988, five additional sugar factories have to be installed, i.e. one mill per year. At an average price of US $40 million for equipment per plant, this represents an investment volume of US $200 million. If seventy per cent can be produced locally, investment of US $140 million, or US $28 annually will be needed. The capacity for local production of the bulk of this portion of the equipment already exists, but for special components an amount estimated at twenty per cent of total investment (i.e. US $30 million or US $6 million a year) will also have to be invested in the equipment producing industry.

Besides this new investment, there will be a continuing investment requirement for rehabilitation and replacement, estimated at US $1.5 million for each 100,000 tons per annum of sugar production capacity installed. This gives an average figure of US $35 million per year for Repelita IV. The same amount will have to be budgeted for spare parts. Here again, it is assumed that 70 per cent, or about US $25 million per annum, can be manufactured locally.

Thus, one reaches the following totals for technically possible local production of sugar mill machinery and equipment during Repelita IV:

	US $ million per year
- investment in new capacity	28
- replacement of outdated equipment	25
- spare parts	25
TOTAL	78

The requisite productive capacity in the main already exists. But it is estimated that US $10 million a year will be required for new capacity to produce special components (US $6 million) and for replacements (US $4 million). This gives a total investment requirement of US $50 million for the five year period.

6.5 Recommendations

The procedure for increasing local content which has been adopted for equipment production in the sugar industry may serve as an example for other sectors. It is applicable to sectors where turnkey operations are common because technical requirements demand the establishment of whole plants as integrated units. Especially the procedure of switching the local engineering company from the role of an affiliate to that of main contractor with a foreign affiliate may well be appropriate for a number of sectors.

The next phases of sugar equipment manufacture are likely to include efforts to raise local content, especially for sub-contracted components, such as pumps, motors and speed reduction gears, and for the more sophisticated equipment through knowhow agreements with foreign partners.

Chapter VII Processing equipment for estate crops: cocoa, coffee, and tea

7.1 Estate crop production:

7.1.1 The present situation

Cocoa. Indonesia has not hitherto been a significant producer of cocoa. Production increased from 5,500 tons in 1978 to 15,000 tons in 1981, but even the latter figure represented less than one per cent of world production.

Cocoa is produced mainly in East and Central Java, North Sumatra, South Sulawesi and Maluku. Government estates still account for most of the output, but private estates have made an increasing contribution to a threefold increase in output during 1978-81, promoted by a programme of rejuvenation and extension of estates, as well as improved pest and disease control, use of fertiliser and cultivation (Table VII.1). Since cocoa trees take seven years to bear fruit, output can be expected to grow substantially during the 1980s in response to extensive recent planting.

Table VII.1: Cocoa production by type of estates, 1978-1982
('000 tons)

Year	Government Estates	Private Estates	Smallholdings	Total
1978	4.3	0.2	1.0	5.5
1979	7.4	0.7	1.0	9.2
1980	8.4	0.8	1.1	10.3
1981 a/	10.4	1.3	1.5	13.1
1982 a/	12.2	1.3	1.5	15.0

Source: Directorate General for Estates.
a/ Provisional figures.

Indonesia's exports of cocoa, mainly to Singapore, increased substantially in volume in recent years (Table VII.2), but a fall in world market prices by one-third during 1978-81 largely offset this gain. More than 90 per cent of exports consists of beans, powder and paste (Table VII.3). Quality requirements are fixed according to International Cocoa Standards. Indonesia also imports cocoa, mainly in the form of beans, presumably to make possible appropriate quality blending (Table VII.4).

Table VII.2: Cocoa exports by value and volume 1978-1982

	1978	1979	1980	1981	1982a/
Volume (000 tons)	6.22	8.63	14.97	17.51	10.49
Per cent increase to previous year	-	38.7	73.5	17.0	-
Value (000 US $)	14.65	22.14	29.76	31.10	16.50
Per cent increase to previous year	-	51.1	34.4	4.5	-

Source: Central Bureau of Statistics, Export Statistics, 1979-82.
a/ Up to June.

Table VII.3: Cocoa exports by type of cocoa, 1978-1982
('000 tons)

	1978		1979		1980		1981		1982a/	
	Vol.	Share%	Vol.	Share%	Vol.	Share%	Vol.	Share%	Vol.	Share%
Beans	2.2	36.1	3.6	42.2	4.7	31.3	6.8	38.8	4.1	39.5
Powder	2.0	32.3	2.4	27.5	9.4	62.7	2.3	13.0	1.5	13.8
Paste	1.0	16.4	2.0	23.2	40.0	0.3	5.8	33.0	3.6	34.2
Butter	0.9	14.0	0.6	6.8	0.9	5.7	1.9	10.9	1.0	9.2
Others	0.1	1.2	25.0	0.3	-	-	0.8	4.5	0.4	3.2
Total	6.2	100.0	8.6	100.0	15.0	100.0	17.5	100.0	10.5	100.0

Source: Central Bureau of Statistics, Exports Statistics 1979-1982.
a/ Up to June.

Table VII.4: Domestic consumption of cocoa, 1978-1981
(000 tons)

Year	Production	Imports	Exports	Apparent Consumptiona/	Annual Growth Rate
1978	5.5	2.1	6.2	1.5	-
1979	9.2	2.9	8.6	3.4	132.3
1980	10.3	8.3	15.0	3.6	6.6
1981	13.1	9.2	17.5	4.8	33.9

Source: Directorate General of Estates and Central Bureau of Statistics.
a/ Apparent consumption = production + imports - exports.

Coffee. Indonesia occupies fourth place (after Brazil, Colombia and the Ivory Coast) among the world's 47 coffee producing countries. Indonesia ranks second (after the Ivory Coast) as a producer of robusta and accounts for nearly 15 per cent of world robusta production. More than 85 per cent of Indonesia's coffee is robusta, less than 15 per cent arabica. As Table VII.5 shows, coffee is mainly a smallholder crop.

Table VII.5: Coffee Production, 1975-1981 ('000 tons)

	1975	1976	1977	1978	1979	1980	1981
Smallholdings	144	178	181	206	209	213	276
Estates	16	16	16	17	19	21	23
Total	160	194	197	223	228	234	299

Source: EIU Quarterly Economic Review of Indonesia, Annual Supplement, 1983.

Most of Indonesia's coffee is exported. Coffee is Indonesia's third largest non-oil export commodity, after timber and rubber. The destruction of much of Brazil's coffee crop by frost in 1975, and shortfalls in supply from Africa, caused a steep rise in world coffee prices which greatly benefited Indonesia and stimulated coffee production. Exports reached US $614.3 million in 1979 and US $656 million in 1980 (Table VII.6). Prices then declined, and Indonesia's coffee exports fell by nearly 50 per cent in 1981 to US $345.9 million. Oversupply on world markets, aggravated by worldwide economic recession, was responsible. Indonesia's availability of coffee normally exceeds its annual fixed quota. The non-quota coffee is mainly exported to Arabian countries.

Table VII.6: Coffee exports, 1975-1981

	1975	1976	1977	1978	1979	1980	1981
Volume ('000 tons)	128	136	160	215	220	238	210
Value (US$ million)	100	238	599	491	614	656	345

Source: Economic Review, Bank Negara Indonesia.

Tea. Most of Indonesia's tea is grown at a height of 1,035-1,550 m., in rather acid soils which are optimal for plant nutrition. Estates whose output is mostly processed to black tea for export have increasingly replaced smallholders and now account for around four-fifths of total production; the share of smallholders who produce mainly green tea for domestic consumption has fallen in one-fifth (Table VII.7). Most of the estates are state enterprises of about 1,000-1,500 ha producing 1,000-1,500 tons per year each.

Table VII.7: Growth of Indonesian tea production, 1974-1981
(000 tons)

	Plantation	Smallholdings	Total
1974	51	14	65
1975	56	14	70
1976	60	13	73
1977	62	14	76
1978	74	17	91
1979	108	17	125
1980	84	18	112
1981	85	22	107

Source: Indonesian Financial Statistics, Bank Indonesia, February 1979.

The average yield of tea per 1,000 ha for estates and smallholders combined was about 720 metric tons in 1977, as compared with 1,540 tons/1,000 ha in India and 880 tons/1,000 ha in Sri Lanka in the same year.

Indonesia ranks fourth among tea exporting countries (1978), but tea contributes less than 3 per cent of non-oil export earnings, and a significantly higher proportion of tea than of coffee (29 per cent as compared with about 15 per cent) is for domestic consumption. Tea exports benefited from the world coffee shortage in the mid-1970s, but prices fell somewhat in the following years. In 1982, earnings rose again (Table VII.8).

Table VII.8: Growth of Indonesian tea exports, 1974-1978

Year	Volume ('000 ton)	Value (US $ million)
1974	55.7	43.6
1975	45.9	53.1
1976	47.5	56.0
1977	51.3	120.9
1978	56.1	94.6
1979	68.0	92.0
1980	n.a.	n.a.
1981	n.a.	n.a.
1982	73.5	116.0

Source: Weekly Report, Bank Indonesia, No. 1040, April 1979; Economic Indicators, January 1979, Central Bureau of Statistics.

7.1.2 Future prospects

Cocoa. During Repelita IV many of the new cocoa plantations will start bearing. Repelita IV target figures for cocoa production indicate a very high rate of growth, about 10,000 tons a year after the first year (1984). This would raise output nearly fourfold by 1988. Up to 94 per cent of output is planned for export (Table VII.9) which implies that a substantial volume of cocoa will continue to be imported.

Table VII.9: Projections of cocoa production and exports, 1984-1988
(000 tons)

	1984	1985	1986	1987	1988
Production	15.7	24.9	35.5	45.4	56.3
Export	12.6	21.8	32.3	42.1	53.0
Share for domestic consumption a/	3.1	3.1	3.2	3.3	3.3

Source: Directorate General of Estates.

a/ Excluding imports.

Coffee. Repelita IV projections for coffee production and export are given in Table VII.10. The target increase in coffee production is 10,000 tons a year over the four years 1984-88, giving a total increase of around 40,000 during Repelita IV. Broadly constant proportions are expected to be exported (75 per cent) and consumed at home (25 per cent).

Table VII.10: Projection of Coffee Production and Exports, 1984-1988
(000 tons)

	1984	1985	1986	1987	1988
Production	309	318	328	338	348
Export	232	239	247	256	264
Domestic consumption	77	79	81	82	84

Source: Directorate General of Estates.

Tea. About ?,300 ha of new estates and 15,000 ha rehabilitation are planned for Repelita IV. The projected production of tea over the period 1984-88 is shown in Table VII.11. The projected growth rate is the lowest of the three crops considered here and amounts to 17,000 tons during Repelita IV.

Table VII.11: Projected Production and Exports of Tea, 1984-1988
('000 tons)

	1984	1985	1986	1987	1988
Production	116	119	122	126	130
Export	77	79	82	85	88

Source: Directorate General of Estates.

7.2 Processing

Cocoa. Cocoa bean processing begins with fermentation. The wet beans are fermented in wooden vats to remove the pulp. The process is carried out in a series of fermentation troughs or vats for period of 12, 24, 25, 20 and 5 hours in succession. The beans are then conveyed by a screw conveyor through a small open channel to a washing pool. The washed beans are first sun dried for six to nine hours and then dried in tray driers for a period of 18 hours in all, at different temperatures. Four tons of wet beans give 1.25 tons of dry beans ready for export.

A typical processing unit handles about 350 ha of plantation, produces about 500 tons of dry beans ready for export and employs about 60 persons.

The processing of cocoa beans requires the following equipment:

1. Flight conveyers, for en masse transportation of the fermented wet beans.
2. Tray driers, with oil-fired heater and fan unit, for drying the wet beans, or rotary driers, with similar heating and air blowing equipment.
3. Cocoa bean grader.

A typical unit producing about 500 tons of dry beans a year requires 1 conveyor, 4 tray driers and 2 graders. The total cost of the equipment per unit in about Rp. 200 million at current prices.

For chocolate and chocolate beverage production, the dry beans are further processed. The beans are ground, the ground powder is prepared into a meal, pressed in special processes to produce cocoa butter and cocoa cake, mostly for exports. There is a small volume of domestic manufacture of chocolate for which the equipment required consists of rather complex and specialised grinders, mixers and presses.

Coffee. Coffee processing involves curing, grading, roasting, blending, grinding and packaging.

Curing: (removing the outer part of the fruit to leave the coffee bean) is done is one of two processes.

Under the wet method, the freshly picked cherries are fed into a tank for initial washing, in order to remove stones and other foreign materials. The washed cherries are then fed into a depulping machine to remove the outer skin and most of the pulp, thus freeing the beans. The beans are then poured into a fermentation tank, usually filled with water, in order to remove the remaining pulp. This process takes from twelve hours to several days. The beans are then dried in mechanical dryers. Parchment is broken by rollers and removed.

Under the dry method, which is used in countries where water is scarce during the harvesting season and in most of Brazil, the ripe cherries are spread on open drying ground, and turned frequently in order to allow the sun and the wind to dry all portions thoroughly. The dry cherries are then transferred to hulling machines for the removal of the husk, parchment and silver skin.

Grading: The green beans are then machine graded into large, medium and small sizes by the use of sieves, oscillating tables or conveyors, removing also damaged beans and foreign matter. The criteria used in grading include imperfections, foreign matter content, colour and roasting characteristics, and, most important, cup quality of the beverage.

Roasting: This develops the desired flavour which is absent in green coffee. The obvious modifications are changes in colour (from green to brown), and a large increase in volume (50-100 per cent). However, the physical and chemical changes that take place during roasting are complex and not completely established.

Blending: After cleaning, green coffee of different varieties or sources are blended, either before or after roasting. Beans are then again sieved, by air lifting, from remaining foreign matter and conveyed to grinders.

Grinding: The beans are first passed through bean cracking rolls, then fed between two more rolls, one of which is cut or scored longitudinally, whereas the other is cut or scored circumferentially. These paired rolls, operating at different speeds, cut rather than crush the bean particles. A second pair of rolls, scored more finely and running at higher speed, achieves a finer grind.

Packaging: An important part of the coffee sold directly to consumers is packed in vacuum cans, although smaller amounts are packed in flexible bags, paper cartons, glass jars, or laminated flexible film and foil packages. For vacuum cans, the ground coffee is conveyed to weighing-and-filling machines. The can is filled with ground coffee by tapping or vibrating, and passes through the vacuum chamber to remove the air. Sometimes, the can is filled with gas such as nitrogen or carbon dioxide. Staling (loss of fresh character when exposed to air) is caused by the volatilisation of the more volatile constituents together with chemical reactions such as oxidation. It cannot be inhibited by antioxidants, but can be slowed at lower storage temperature or by vacuum packing.

Equipment used: The following equipment is required for processing coffee beans (wet method):

1. De-pulper, for separating pulp and beans.
2. De-pulper cum washer, for separating beans and washing.
3. Pump with motor, for pumping wet parchment coffee or wet coffee cherries.
4. Rotary driers, for drying wet parchment.
5. Hullers, for treating dry parchment coffee, or dry cherries.
6. Catador, for separating husk peels and dust.
7. Vibrating grader, for bean size classification.

For a processing unit with 10,000 tons per annum capacity, the equipment required is four depulpers, four depulpers cum washers, one pump, four rotary driers, two hullers, two catadors and two graders. The total cost per processing unit is about US $500,000.

The equipment for roasting includes coffee roasters and sieves, for grinding bean cracking mills for coarse grinding and grinding mills for fine grinding. For instant coffee, the same equipment as above is used for blending, roasting and grinding; other equipment includes coffee extractors, clarifiers, spray driers and screens.

Tea. Processing of tea involves withering, rolling, fermentation, drying and grading.

Withering. The freshly plucked shoots are dehydrated by passing air through loosely packed fresh leaves. This process lasts up to twenty hours. besides reduction of moisture which renders the leaves malleable, some chemical processes occur.

Rolling. The purpose of this stage is to subject the withered leaf to a wringing action in a rolling machine.

Fermenatation. This word is still retained by the tea industry to describe the operation of enzymatic oxydation and condensation of the flavanols. During this process, the colour changes from green through olive green to light brown. At optimal point, the fermentation is stopped by heat, exposing leaves to hot air (85-95°C) in a drier.

Drying. In this operation, the leaf is carried through the drier on a series of metal trays, moving slowly. The leaves fall from one level to the other, until completely dried tea falls off the last tray and exits after about 15-30 minutes.

Grading. Using sifting machines the dried leaf is sorted mechanically or by air flotation into various broken and powder grades and packed with a moisture content of around three per cent. Other qualities of tea, green tea (enzymatic oxydation being inhibited by steam shock) or instant tea may be found on the market.

The dry tea leaves can be separated from coarse to very fine. The types of dry tea are sorted into three groups, that is tea leaf, crushed tea and powdered tea. These three large groups can be further divided into several types.

The equipment used for processing tea is:

1. Withering troughs with blowers
2. Rolling machines, rotary rollbreakers, rotorvane machines
3. Sorting machines, stalk extractors.
4. Driers, multistage
5. Graders, rotary tea sifters
6. Vibratory tea packers
7. Heat exchangers
8. Suction winnowers and dust collectors.

7.3 Equipment production

The equipment for cocoa bean processing is relatively simple and is produced locally.

Some of the equipment for coffee processing is also locally manufactured or assembled. But in general, the equipment at present used in the coffee bean processing units at the estates is of very old design and inefficient in operation (particularly the driers), leading to enormous consumption of fuel. The cost of drying equipment at present accounts for 65 per cent of total costs of processing equipment. Quality standards in respect of moisture content are stringent for exports, since export coffee has sometimes to be stored for considerable periods. Export prices depend on quality. A "defect system" for grading Indonesian coffee for export has been introduced. Quality variations have caused price differentials involving losses estimated at some US $40 million a year to Indonesia in the recent past.

In earlier years, most of the equipment for coffee processing was imported. At present, about 80-85 per cent of the machinery are reported to be made locally. But this is difficult to confirm. Much of it may consist primarily of assemly.

The production of tea processing equipment is carried on in several general workshops, in Bandung and elsewhere. In 1980, 27 units valued at Rp. 142.6 million were produced.

7.4 Investment implications

There are some similarities among the processing equipment for the three estate crops considered here, especially between cocoa and coffee. The rotary driers for coffee and cocoa are very similar in construction, and cocoa graders are similar to coffee bean graders. The demand for the cocoa processing equipment, added to that for coffee, tea and other similar equipment, could bring demand up to levels economic for domestic manufacture.

To process an additional 40,000 tons of cocoa beans requires about 80 units of 500 tons capacity each, over the period 1985-88, at the rate of about 20 units per year. This would result in an annual demand for equipment as follows:

20	flight conveyors
80	tray driers with heater and blowers
40	cocoa graders.

<u>Summarising</u>, the investment volume for the processing of the three crops is as follows:

- cocoa: US $16 million for 1985-1988 or US $4 million annually
- coffee: US $ 4 million for 1985-1988 or US $1 million annually
- tea: US $ 8 million for 1985-1988 or US $2 million annually
- Total: US $28 million for 1985-1988 or US $7 million annually.

All this equipment can "technically" be produced in Indonesia with a local content of about 80 per cent. The remaining 20 per cent consists of special components (bearings, electric motors, etc) which will have to be imported. The resulting production would be US $5.6 million per annum in value. The employment generated would be about 250 new jobs. Some of the capacity to produce this equipment is already installed in Indonesia. It is estimated that additional investment of about US $3 million will be needed to improve and enlarge equipment production capacity.

7.5 Recommendations

The technical capacity for domestic production of much processing equipment for cocoa, coffee and tea already exists in Indonesia. However, little is known about the capacity of the existing relatively small-scale equipment producing industry to produce economically and efficiently. It is therefore recommended that this sub-sector be further investigated to determine the strong and weak points of the existing industry. This should lead to recommendations concerning the strengthening of existing enterprises and the establishment of new plants, including requisite information about the additional investment, technology and manpower requirements.

Chapter VIII Wood Processing Equipment

8.1 Timber production

More than sixty per cent of Indonesia's land area is covered by tropical forest. The country's forestry potential is among the greatest in Asia but will in future need to expand its forest conservation and reafforestation activities to hold this position.

The total forest area of 122 million ha is officially classified as follows:

- according to exploitability
  - exploitable: 45 million ha (37 per cent)
  - potentially exploitable: 48 million ha (39 per cent)
  - others: 29 million ha (24 per cent)

- according to legal status
  - reserved: 47 million ha (38 per cent)
  - protected: 48 million ha (39 per cent)
  - unclassified: 28 million ha (23 per cent)

Such data on exploitable forest reserves, however, have to be treated with caution. In many countries there has in the past been serious overestimation which has led to excessive depletion. Some reserves are in remote and inaccessible areas (e.g. Irian Jaya) and cannot be regarded as economically "exploitable" because of high transport costs. Exploitation of some forests in undesirable for environmental reasons, such as soil erosion (e.g. on steep slopes) or disappearance of the tree species.

At present, forest exploitation in Indonesia is concentrated in Kalimantan which accounts for more than 50 per cent of logging activity. Of the approximately 4,000 species of trees, 127 are commercially useful. The main species cut for export are Meranti (53 per cent), Ramin (15 per cent), Kapur (8 per cent), Agathis (3 per cent) and Pulai (2 per cent). Teak has a share of only 0.2 per cent.

During the 1960s and 1970s, forest exploitation in Indonesia expanded very rapidly, largely for export of logs to Japan, the Province of Taiwan, the Republic of Korea and elsewhere for plywood and other processing. In 1978, the Government of Indonesia decided to enforce increased domestic processing by, in effect, drastically and progressively restricting export of logs, with a view to banning it completely from 1985, and promoting domestic plywood production.

At present, under contracts with the Indonesian Government, timber concessionaires are obliged from the seventh year of operation onward to process locally 40 per cent of the Annual Allowable Cut (AAC) and export it in processed form. The result has been an investment boom in saw mills, veneer and plywood manufacturing. In some cases, production plants in the Republic of Korea, Japan and the Province of Taiwan which formerly depended on Indonesian logs as inputs, threatened with shutdown, have relocated in Indonesia. These policy changes have brought dramatic change in the volume and composition of Indonesian timber production and exports.

Table VIII.1. shows production of logs and sawn timber over the period 1976-81. After rising by 22 per cent in the first three years, log production dropped sharply by 37 per cent between 1979 and 1981. Table VIII.2 shows that the decline in log production largely echoed the decline in exports, chiefly of logs, although the world recession contributed to the fall in export earnings, in terms of both volume and price. There was a further decline in 1982.

Table VIII.1: Timber production 1976-1981

Year	logs (m^3) (000 m^3)	Sawn timber (m^3) (000m^3)
1976	20,803	635
1977	22,335	605
1978	24,743	1,513
1979	25,314	1,637
1980	25,190	1,794
1981	15,954	2,658

Source: Forestry in Indonesia, 1983.

Table VIII.2: Exports of timber 1976-1981

Year	Logs		Sawn timber		Total	
	1,000 m^3	Mill. US$	1,000 m^3	Mill. US$	1,000 m^3	Mill.US$
1976	17,877	729.28	644	52.47	18,521	781.75
1977	19,212	900.97	594	50.30	19,806	961.27
1978	19,443	909.31	757	85.76	20,200	995.07
1979	18,205	1,551.33	1,284	245.33	19,489	1,796.66
1980	14,416	1,548.86	1,225	256.81	15,541	1,805.54
1981	6,201	579.29	1,171	188.64	7,372	767.93

Source: Forestry in Indonesia, 1983

8.2 Processing

The generally accepted technology in relation to the timber using industries distinguishes between "primary" processing which uses the log as the raw material (and thus includes not only saw milling, but also veneer, plywood and fibre board production) and "secondary" processing which uses an intermediate product, such as sawn timber or plywood, as raw material for the manufacture of wood products (building timber, furniture, wood carvings, etc.) and employs wood working machinery.

Processing Equipment

There is no need for a detailed description of the various kinds of equipment used in saw milling and wood working with their relatively straightforward technology. Plywood production, however, requires a very wide range of partly quite sophisticated machinery.

Saw milling equipment consists mainly of various types of (band) saws, the log intake, the distribution system which transports sawn logs for further sawing and the final transport and sorting system.

1/ For a detailed description of the wood processing equipment, see UNIDO "Technical Criteria for the Selection of Wood Working Machines" UNIDO/ID/247.

Wood working equipment may be divided into equipment for machining and for assembly. In most cases, the minimum capacity for economic equipment production is relatively small (i.e. 100-200 wood working machines a year) if labour-intensive machining processes are employed.

The Processing Industry

The Present Situation

Saw milling. Following the Government decision to increase the value added of exports by coupling log export permits to the installation of wood processing units, local production of sawn timber, veneer and plywood increased considerably from 1979 on. Nominal capacity for sawn timber is about 8.1 million m^3 and of plywood 3.5 million m^3; working capacity is approximately 20 per cent less. Some of the saw mills in Kalimantan reach only 50 per cent use of their nominal capacity owing to outdated equipment (even though only recently installed). The enterprises also tend to report high installed capacities since this favourably influences their log export quota. Total capacity is divided among 175 enterprises with concessions and in operation, with an average daily capacity of 150 m^3 (Table VIII.3).

Table VIII.3: Saw mills - number, capacity, production and export (in million m^3)

	1979		1980	1981		1982	1983	
	Number	Capacity	Capacity	Number	Capacity	Capacity	Number	Capacity
License request	44			100	2.8			
Under construction	15			27	0.8			
In operation	145			202	6.3		175	8.1
Production of sawn timber		4.0			7.3	8.4		
Export			1.2		1.3	1.4		

Source: BKPM (quoted by FGU Kronberg Unternehmensberatung).

Besides these establishments, there is a large number of hand saw mills with a daily output of 0.5 m^3 which are not registered, and a number of partly registered small enterprises with band saws and daily capacity of 10-30m^3. The majority of the new saw mills are installed in Kalimantan, followed by Sumatra and Sulawesi. Maluku and Irian Jaya are still of little importance.

At present, the investment cost in Indonesia of a 3-line saw mill is in the range of US$ 2 million for a capacity of 70,000 m^3 per annum, that is US$28.6 per m^3. This figure is relatively low and indicates that the operational quality of the machinery is low, with adverse effects on the quality of the sawn timber. There is now a trend towards improved end product quality in the Indonesian saw mill industry, since good quality finds buyers even in a fairly stagnant export market.

Plywood production. According to BKPM statistics, there were in 1983 investment applications for 105 plywood factories with a total capacity of 3.6 million m^3. In operation were 67 factories with a licensed capacity of 3.5 million m^3 and a production of 3.1 million m^3 (Table VIII.4). Capacity utilisation, according to to the data in Table VIII.4, is running at 89 per cent; 81 per cent of production was exported. According to BPS statistics, there were in 1981 31 plywood factories in operation, employing 26,212 persons and having a gross value of output of Rp. 290 billion and value added of Rp. 130 million. According to the Directorate-General of Forestry, licences granted (including plants in operation) totalled 119 in May 1983. Of these, 68 were located in Kalimantan, 30 in Sumatra, 11 in Maluku, 5 in Java, 4 in Sulawesi and 1 in Irian Java.

Table VIII.4: Plywood factories - number, capacity, production and export (in million m^3)

	1979		1981		1983	
	Number	Capacity	Number	Capacity	Number	Capacity
License request	32	1.3	118	5.0	105	3.6
Under construction	6	0.3	20	0.9		
In operation	21	0.8	34	1.6	67	3.5
Production		0.6		1.1		3.1
Export		0.1		0.8		2.5

Source: BKPM (quoted by FGU Kronberg Unternehmensberatung).

The investment costs in machinery and equipment of plywood factories range from US \$80 to US \$480 per m^3, according to an analysis of 15 enterprises in Indonesia. The enormous range of these figures, by a factor of 6, precludes any firm conclusions. Internationally, one counts at present with investment costs of US \$200m^3 for a 3-line plant producing high quality plywood.

Statistical data on wood products manufacture in Indonesia are very incomplete, with wide variations in data from different sources. The figures in Table VIII.5 are based upon Part II of this study.

Table VIII.5: Industrial establishments in wood products (except wooden furniture) and wooden furniture

	Year	Wood products (except furniture)	Wooden Furniture
No. of establishments	1970	107	43
	1980	483	137
Employees (thousand)	1970	7.0	1.7
	1980	58.9	5.7
Value added (billion Rp.)	1970	1.9	0.4
	1980	149.1	4.26
Gross output (billion Rp.)	1970	2.3	0.4
	1980	37.7	8.8

Source: Part II Annex Tables 11 and 12.

Furniture and wood working is predominantly a small-scale industry, with an estimated 4,000 establishments. At most 10 per cent of the industry is mechanised, and at most 20 firms (a majority in the Pulo Gadung Industrial Estate, Jakarta) are engaged in serial production of furniture, joinery and wood work items. The other plants are concentrated in the urban centres in Java and Sumatra. Except for a very few firms in Java, product quality is still low and would hardly be acceptable in the international market. The industry sector is represented by the Indonesian Woodworks Manufactures Association, with head office in Jakarta.

The importance of the small industry sector can also be gauged by the remarkable increase in sales of small (workshop type) wood working machinery of up to US\$ 5,000 sales value in recent years. According to information supplied by importers, imports of these machines rose from 250-400 pieces in 1975 to more than 10,000 pieces in 1982/83, before the rupiah devaluation of

March 1983 (Table VIII.6). Most of the imports have been from Japan and Germany.

Table VIII.6: Market data on woodworking machinery

Product	Order of sales price in Indonesia US$	Estimated annual sales (1982/83) (pieces per year)
Bandsaws (C 800m)	2,000-3,000	5,000
Heavy duty circular table saws (up to 150 mm cutting depth)	1,500-2,000	5,000
Planing machines (working width 510 mm)	3,000-10,000	2,000-3,000
Milling machines	4,000-6,000	2,000

Source: FGU Kronberg Unternehmensberatung.

There is one particle board plant with 30 TPD capacity and one fibre board plant with a capacity o 3,000 m^3 per annum running in 1981 at 33 per cent capacity and producing 1,000 m^3.

Future prospects

Table VIII.7 presents output and export demand projection for logs, sawnwood and plywood for the period 1982-1990. The projections of sawnwood and plywood exports take into account the growth of overseas markets and assume a slow but steady improvement in the competitive position of Indonesian exports in terms of product quality and marketing capabilities. The expanion of plywood exports is a very important element in Indonesia's industrialization strategy combining resource based and export led growth. This requires broad based supportive measures by the Government. The government plans to establish a wood processing centre at Marunda while similar projects are planned in several key ports in Java, Sumatra, Kalimantra and Sulawesi.

Table VIII.7 Export prospects for wood products, 1982-1990
(million m^3)

	1982a/	1983	1984	1985	1990
Production (in million m^3)					
Logs b/	15.9	16.6	16.8	16.4	24.0
Sawnwood b/	3.8	3.9	4.2	4.4	6.0
Plywood	2.2	2.6	3.1	3.4	5.0
Export Volume (in million m^3)					
Logs	4.0	3.5	2.0	0.5	1.5
Sawnwood	1.4	1.5	1.6	1.7	2.5
Plywood	1.2	1.4	1.7	1.8	2.8
Export Values (in $ million)					
Logs	340	311	190	52	225
Sawnwood	226	254	312	374	815
Plywood c/	274	344	425	468	994
Total	840	908	927	894	2,034

a/ Estimate.
b/ Includes conifers and non-conifers.
c/ Includes veneers.
Sources: Indonesia, policies for growth with lower oil prices, World Bank, May 12, 1983 (Report No.4279).

These projections, however, are subject to an important proviso arising from overseas technological development since the late 1970s. A new fibre board process has come into operation in the United States. Together with the wafer board which is an earlier fibre technology, it is rapidly displacing plywood in North America and Europe. The new product is called medium-density fibre board (MDF). It has high form stability, is simple in production based on wood chips as raw material and can be made humidity-resistant through the addition of chemical agents. Annual production is at present doubling every two years in the USA.

Investment costs for the equipment to produce MDF (annual capacity: 50,000 m^3) is of the same order of magnitude as for plywood, but with lower construction costs and auxiliary installations, so that an overall investment saving of 10-20 per cent can be achieved. It can therefore be assumed that new investment after 1986 will in most countries be in fibre board plants. The implications of this development for Indonesian timber processing planning are momentous. While it is not possible at this stage to assess how far the estimates of investment requirements for plywood production given above would be affected, major changes in plans for new capacity in the plywood/fibre board stage of wood processing may need to be made very soon. A careful study of the situation is urgent.

8.3 Equipment Production

The most important equipment for saw milling, the saws themselves, are high precision instruments which cannot be recommended for local production at this stage. Most of the log intake (other than hydraulic lifting equipment), the distribution system and the final transport and sorting system can technically be built in Indonesia. Local content can technically be of the order of 50 per cent of equipment value.

The equipment for plywood production which is technically capable of being produced in Indonesia represents about 30 per cent of the value of a plywood factory. Assuming that plywood remains the preferred processing material and product, it should technically be possible to extend the local content gradually to about 60 per cent. Special reference should be made to driers, demand for which will come not only from the plywood industry but also from saw mills and other wood working plants. The investment cost of driers is of the order of US$ 10 per m^3 for larger capacities (50-100,000 m^3 p.a.) of which 60 per cent can technically be built domestically. The extremely difficult control equipment, which accounts for the other 40 per cent, is not at this stage suitable for local production. An analysis of the market potential for driers would be desirable.

The castings required for wood working machinery should initially continue to be imported, with a view to domestic foundry production at a later stage. Of the general purpose machine tools required, 80 per cent should be technically capable of local production.

If medium-density fibre board (MDF) increasingly replaces plywood, processing equipment requirements will be significantly different, as the following list of required equipment shows:

1. Wood manipulation
   - wood and sawmill waste transport
   - *chippers

tanks, structural equipment

2. Defibration

conveyors

*magnetic separators

*defibration machines

*fibre silos with charging equipment

fibre driers

dry silos

pneumatic conveyors

mechanical conveyors

3. Gluing unit

measuring units

*gluing machines

conveyors

The items marked * are substantially different from equipment required for plywood production. Feasibility of domestic production of such equipment would require further investigation.

The castings required for wood working machinery could initially continue to be imported, and gradually be subcontracted to other local suppliers with a view to domestic foundry production at a later stage. Of the general purpose machine tools required, 80 per cent should be technically capable of local production.

8.4 Investment Implications

Saw milling. Repelita IV targets for saw milling require an addition of at least 5.6 million m^3 new capacity to the 1983 figure of 8.1 million^3 for existing capacity. This is equivalent to 80 additional saw mills with 3 lines and an annual capacity of 70,000 m^3. At US$ 2 million for the machinery of each unit, one arrives at a total of US$ million 160 new investment over the five year period, or US$ 32 million a year. To this must be added replacement investment estimated at US$ 17-28 million (7 per cent of capacity annually, i.e. 0.6-1.0 million m^3) and US$ 23-40 million for parts and components (10 per cent of installed capacity). Total annual investment required in the saw milling industry during Repelita IV, given Repelita IV output targets, comes to US$ 72-100 million. Close monitoring will, however, be necessary to determine whether these are realistic figures.

Plywood fibre board. Expansion planned to 1985 (2.4 million m^3) will require investment in equipment, at US $200/$m^3$, of US $480 million. From 1986 to 1988 another 1.1 million m^3 capacity is planned to be installed, representing investment cost of US $220 million or US$ 73 million a year. These figures may need to be revised if plywood is partially replaced by MDF.

Some of the plywood making machinery and equipment at present in use will need to be replaced by higher quality installations. These investments are cautiously estimated at US $50 million (0.25 million m^3 at US $200/$m^3$) for the three year period 1986-88 or US$ 17 million a year. This gives the following order to magnitude for required investment:

	US $ million per year
new investment 1983-85 (US $480 m.)	160
new investments 1986-88	73
replacements 1986-88	17
production inputs and auxiliaries (US $20/$m^3$ of installed capacity)	140
spare parts (US $10 per m^3)	70
	460

For the period after 1985, this estimate suggests an annual investment requirement by the plywood fibre board industry of around US $300 million.

Wood working. Growth in the use of wood working machinery can be expected to continue its strong performance of recent years, to which improvement of electricity supply all over Indonesia is also contributing. It is assumed that average annual sales of simple machinery will double every year during Repelita IV. At the same time, demand for more versatile and complex machinery will rise. Annual sales of the machinery considered in Table VIII.6 may be estimated as follows:

	US$ million per year
Band saws 5,000 pieces p.a.	12.5
Circular table saws 5,000 pieces p.a.	10
Planing machines 3,000 pieces p.a.	19.5
Table milling machines 2,000 pieces p.a.	10
Total	52

Some of these simpler machines may well be gradually replaced by more expensive ones. However, these figures suggest that the total market value of sales of all wood working machinery may well reach US$ 100 million per year.

<u>Totals</u>. Assuming that the same percentage of technically possible local content applies to new installations and replacements, the following totals for technically possible local production in the various sub-sectors of the wood processing industry result from the above estimates:

	US $ million per year
Saw milling	36-50
Plywood/fibre board	
first stage	90
second stage	135
third stage	180
Wood working machinery	65

Totals average US $200 million a year in the first stage, US $240 million in the second stage and US $290 in the third stage. Total employment generated might be some 10,000 to 12,000 persons, and the required investment in equipment producing capacity in the order of US $150 million.

8.5 Recommendations

Any investment and domestic production decisions where amounts of this magnitude are involved clearly require careful further analysis, both with reference to production equipment and to replacement components and spare parts.

For the establishment of saw mills and fibre board production plants, the integrated approach already adopted in the sugar industry and recommended for edible oil and cement production commends itself. For wood working machinery, driers, components and spare parts the desirable next step is a sub-sectoral analysis leading to assessment of the technical and economic feasibility of domestic production and of the know-how requirements and sources.

Chapter IX Cement Processing Equipment

9.1 Cement production

9.1.1 Present situation

Indonesia has by far the lowest per capita cement consumption among east Asian market economies (Table IX.1). Per capita consumption in Thailand is more than three times, in the Philippines and Malaysia more than four times and in Singapore almost ten times as high as in Indonesia.

Table IX.1: Per capita cement consumption in Asia

Country	Kg. per Person
Japan	600
Singapore	580
Korea	560
Taiwan	540
Malaysia	250
The Philippines	220
Thailand	200
Indonesia	60

Source: Indocement Group.

Production of cement, however, increased very rapidly from 542,000 tons in 1969 to 6,844,000 tons in 1981-82. The provisional figure for production in 1982-83 stands at 7.7 million tons (Table IX.2).. The aim has been to achieve self-sufficiency but this has not yet been reached. While domestic production grew rapidly, imports have also risen substantially, from only 6,300 tons in 1979 to 506,526 tons in 1982. From time to time, temporary surpluses have been exported in small quantities.

Table IX.2: Production of cement in Indonesia 1978/79-1982/83
(000 tons)

Year	1978/79	1979/80	1980/81	1981/82	1982/83 a/
Production	3,629	4,705	5,852	6,844	7,650

Source: Quarterly Economic Review of Indonesia, Annual supplement 1983, The Economic Intelligence Unit.

a/ Provisional.

The installed production capacity increased from 2.7 million tons in 1977 to 8.7 million in 1981 and 11.7 million in 1983. There are 8 companies with installed capacities varying from 500,000 tons per annum to 4.7 million tons in 6 factories. The plants are located mainly in Java and Sumatra (Table IX.3). Capacity utilisation varies between 65 and 75 per cent which is comparatively low for cement industry.

Table X.3: Plant installed capacities and location (1983)

Company/plant	Location	Capacity (000 tons)
P.T. Semen	Padang	1,430
P.T. Semen	Gresik	1,500
P.T. Semen	Tonasa	620
P.T.Semen	Cibinong	1,200
Indocement Group (6 plants)	Cieureup-cibinong	4,700
P.T. Semen	Nusantara	750
P.T. Semen	Baturaja	500
P.T. Semen	Andalas	1,000

Source: Indocement.

Three types of cement are produced locally: ordinary portland cement; white cement (lower ferric-oxyde content); and oil-well cement class G, with accelators or retarders to cover a wide range of well depths and temperatures (production capacity of 150,000 tons per year, sufficient to cover demand). The most widely produced kind is portland cement which is ideal for all normal purposes. Planned capacity expansion is almost entirely for portland cement.

9.1.2 Future prospects

Cement consumption has been rising annually by 13 per cent. To meet this demand, and if possible to replace net imports by an export surplus, capacity expansion plans are ambitious: for 1985, 13.4 million tons and for 1987, 17.9 million tons per annum capacity. However, financial constraints have caused a readjustment of important construction projects, so that future market growth will probably be lower than in the recent past. Among various factors causing uncertainty about future prospects are cutbacks in government and state enterprise construction programmes; slowdown in the growth rate of cement production, shortage of public investment funds for new cement plants and uncertain potential. Allowing for these uncertainties, estimates of future capacity and production development are presented in Table IX.4. It should be emphasised that these figures represent at best orders of magnitude.

Table IX.4: Estimated development of installed plant capacity and production of cement, 1985-1993
(million tons per year)

	1985	1987	1989	1991	1993
Capacity	13	15	17	19	21
Production	12	13.5	15	17	19

Source: FGU Kronberg Unternehmensberatung.

9.2 Processing

Cement manufacture consists principally in mixing finely ground raw materials and additives (limestone, marl, clay, shale, slag, iron ore, bauxite, silica, sand) and in clinkering the mixture, dry or wet, in kilns (usually rotary) at temperatures of up to 1,450°C.

The clinker is ground after cooling with a small percentage of gypsum, which controls the setting time by acting as a retarder, to produce the finished product. The fineness of cement is defined in terms of its specific surface area, in cm^2 per gram (Blaine number) or the equivalent in other units of measurement.

Two principal processes, wet and dry, are used to make portland cement. They differ mainly in the way the raw materials are ground and mixed before being introduced into the kiln. The dry process offers various advantages, especially lower energy costs and higher plant capacities than the wet process. It has therefore almost completely replaced the traditional wet process.

In the dry process, the raw materials are dried, ground and homogenized before being fed into the rotary kiln system, either as a mixture of dry powders or as a modulised material (Lepol process).

The rotary kilns for making clinker by the dry process are either long and of large diameter, as in the wet process operation, or they are relatively short and equipped with a pre-heater system, for example, a series of cyclones in which the material is suspended in the hot exhaust gases of the kiln. The latter technology has been preferred recently as it allows higher production capacities with less weight of production equipment.

The main categories of equipment of cement factories are shown in Table IX.5. The main elements of cost are construction costs and mechanical equipment, approximately one-third each of the total investment costs. The remaining third is made up mainly of erection and commissioning and electrical equipment. The quarry equipment (almost five per cent of total investment) is, strictly speaking, to be considered under mining equipment; similarly, auxiliary installations (1.5 per cent) belong to other capital goods sectors.

Total investment costs for equipment and installation (excluding construction) of a cement factory of 500,000 tons per annum (1,500 tons per day) capacity amount to about US $100 million, for a plant of 1.5 million tons per annum capacity (4,500 tons per day) the cost is US $155 million; in other words, there are very large economies of scale. About 30 per cent of these amounts represent cost of installation and commissioning.

Table IX.5: Main categories of cement plant equipment and share in investment cost

Type of equipment	Share in investment cost (%) of category	of total
Quarry equipment	100	4.6
Mechanical equipment	100	32.6
Raw material pre-crushing section	5.9	
Raw material storage	11.6	
Raw material grinding and drying section	12.0	
Raw mix silo equipment and transport system	3.2	
Kiln section	15.8	
Firing section	3.4	
Dust collecting section	4.9	
Clinker and gypsum store	14.7	
Cement grinding section and transport system	14.7	
Cement silo equipment	1.1	
Packing system and loading of bagged and bulk cement	5.7	
Grinding media	3.0	
Refractory material	2.9	
Miscellaneous: cranes, elevators, vehicle scales, connecting elements, etc.	1.1	
Electrical equipment	100	12.1
electrical supply and distribution equipment	66.7	
Control equipment	33.3	
Auxiliary installations	100	1.5
Laboratory	22.7	
Workshops	44.0	
Water system: treatment, recovery and distribution	12.1	
Factory service installations: fire brigade and first aid	21.2	
Spare parts	100	2.3
Erection and commissioning	100	13.4
Construction costs: buildings, silos, roads, etc.	100	33.5
TOTAL		100.0

9.3 Equipment production

Cement factories are highly sophisticated and technologically complex "products". The purchaser of a cement factory expects the supplier to assume all technical risks which are usually subject to severe penalty clauses in purchasing contracts. It is therefore not easy for a new supplier to match the experience and credentials of the small number of internationally known cement factory producers.

At present, steel ducting, chutes, tanks and bins are fabricated locally. They represent less than 40 per cent of total investment costs. Among the major categories of equipment listed in Table IX.5, the following have the best potential for additional local production:

- Mechanical equipment: simple and more complex sheet metal products, those produced by automatic welding and conveyor and transport systems.
- Electrical equipment: switchboards, low and medium voltage switchgears, cables, control panels, some printed circuits, lighting systems, telephone installations and some electric motors.

Some quarry equipment, auxiliary installations, erection and commissioning and construction could also be supplied locally. Some spare parts are already produced by either the workshops of the cement factories or local repair work shops. The major spare parts with potential for future local production are refractory bricks (not yet produced but subject to applications for production licences) and castings of high quality (as yet rare in Indonesia).

In addition to the assumed annual investment of US $200 million for new cement factories, replacement investment and spare parts will be required. Table IX.6 presents estimates of annual expenditure on equipment for new factories and spare parts for the cement industry. The estimates do not include the possible start-up in Indonesia of electric motor manufacturing on a large scale or the production of heavy equipment, such as speed reducers, heavy bearings, heavy crushers, firing systems or advanced electronic and control equipment. On a long-run basis, which would require much further technical and economic analysis, additional production of some US $30 million in value (at present prices) may be achievable.

Table IX.6: Estimation of possible annual production value of equipment and parts for the cement industry

	Average annual production value (million US $)
A. Investment[a]	
simple sheet and structural metal works	20
major metal works and automatic welding	20
conveyors and transport systems	10
electrical distribution and telephone equipment	5
control equipment	2
refractory bricks	3
grinding balls (special casting)	2
sub-total	62
B. Spare Parts	
refractory bricks	2
grinding balls	2
steel and grey iron castings (for cyclone, mills, crushers, etc.)	4
Sub-total	8
Total	70

a/ Because of the durability of the equipment there will be hardly a replacement demand which would not be done either by the workshop of the cement plant or the original international supplies.

Much of the heavy equipment for cement factories (electric motors, speed reducers, etc.) is similar to corresponding equipment needed by other industries. The feasibility of domestic production should be considered with this fact in mind. However, local production of these items is unlikely to start before the latter years of the decade, i.e. in Repelita V. In any case, the high technology involved, and the requisite high reliability, demand cooperation with internationally known manufacturers. Such cooperation is also desirable to guarantee equipment performance.

Refractory brick production for the cement industry may be put at US $3 million per year. To this should be added the potential demand of other industry branches which use such bricks. The BKPM has recently received investment applications for the production of refractory bricks. Presumably their manufacture will begin in the near future.

Castings have a production potential of 8,000 tons per annum. On the basis of the Indonesian price of US $1,000 per kg, this represents an annual output worth US $8 million. Several decentralised and specialised foundries could be desirable, e.g. four foundries with 2,000 tons capacity each, which would serve the cement factories in their region. The investment required is about US $5 million (or US $1.25 million for each foundry) and the employment generated might be 200 new jobs.

9.4 Investment implications (N.A.)

9.5 Recommendations

The technology of cement factories, which has some sophisticated and technologically complex features, makes it difficult to develop domestic production of individual components. A subsectoral analysis is needed as the basis for specific recommendations. As in the case of the sugar industry, the best strategy is likely to be to aim at the establishment of integrated plants by joint ventures between international and Indonesian companies, on the understanding that there will be a gradual increase of local production of equipment. In cooperation with the joint venture partners, policy guidelines could be drawn up for the increase in local content, including incentives for sub-contracting of part of the equipment to domestic firms and the development of production facilities for heavy machinery and equipment. Some of these items might be included in the planning of a General Machine Shop in Surabaya. For the establishment of production facilities for electrical, electronic and control equipment, close cooperation with the existing industry is obviously desirable. The foundry project or projects should be carried out with a foreign partner with the requisite knowhow.

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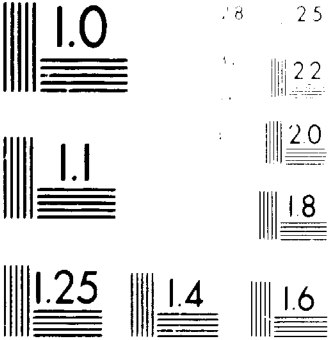
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X. Equipment for the Textile Industry

Introductory Note

There has always been traditional small-scale and handicraft production of textiles in Indonesia, but the modern textile sector consisted until the 1960s only of medium-sized cotton weaving enterprises, mostly established during the inter-war years. A few large spinning mills were added in the decade 1955-65. The rapid development of the modern textile industry began with Repelita I, leading in the 1970s to the establishment, chiefly through Japanese investment, of large integrated textile plants. Between 1973 and 1983 yarn production increased almost tenfold and output of textile fabrics nearly sevenfold. Realised foreign investment in the textile and leather industry during the period 1967-1981 is estimated at US $ 999.1 million by 60 foreign companies (about 35 per cent of total realised foreign investment), as well as US $1,040.3 million of domestic investment (approved) for textiles. Employment in the modern textile sector was put at 229,900 persons in 1980. Side by side with the modern textile industry, there remains a large small-scale and handicraft sector for which few reliable statistics are available but which probably provides (often part-time and intermittent) employment for up to 0.5 million people.

The Indonesian textile industry faces serious adjustment problems. During the 1970's the industry expanded rapidly in response to growing domestic demand. The industry provided low quality garments and enjoyed high levels of effective production (ranging from 331 per cent for knitting and 56 per cent for spinning). The result was the emergence of a high cost textile industry which was not competitive internationally. Today the textile industry suffers from outdated equipment and overcapacity (in particular the weaving industry) owing to rapid expansion without sufficient regard to the domestic demand pattern. The main challenge for the 1980's undoubtedly lies in the encouragement of greater efficiency and improved international competitiveness.

The textile industry in Indonesia is so large and diversified that it cannot be covered in any depth in the framework of the present study. An in-depth study would need to assess market prospects at home and abroad for each of the four main sub-sectors - spinning, weaving/knitting, finishing (dyeing and printing) and garments production. It would need to examine the relevance to Indonesia of the rapid changes in modern textile technology which are going on in the world and which must have profound effects on appropriate equipment for textile plants in the next decade and beyond. Finally, it needs to concern itself with the present condition and future propects of the small-scale and handicrafts sector and its equipment requirements. None of this has been possible in the short time available for this study.

The following analysis, therefore, is even more tentative than that in the other industry studies of this report and should be read as such. It focuses primarily on two sub-sectors of the modern textile industry, yarn and fabric production, and leaves aside both the finishing industry (which may be the sector most in need of modernization) and the small-scale and handicrafts sector.

10.1. Textile Production

10.1.1 The Present Situation

Textile industry statistics have improved in recent years, but still have many deficiencies. Table X.1 presents statistics of textile production during Repelita II and III. The industry is heavily concentrated in Java, only 8 per cent of textile production being located on the other islands. Jakarta alone accounts for 15 per cent.

Table X.1: Production of cloth, weaving yarn and fibres in Indonesia

Year	Fabric (mill. m)	Weaving yarn (000 bales)	Synthetic fibres (000 tons)
1973	0.927	316	-
1975	1.017	445	8.8
1977	1.333	678	61.2
1979	1.920	998	73.0
1981	2.094	1,233	112.0
1982 a/	1.709	1,370	-

Source: Department of Industry.
a/ Provisional

There are approximately 70 spinning enterprises with an installed capacity of approximately 200,000 tons. The number of spindles installed was 482,000 in 1968 and had risen to over 2 million by 1981. The Repelita III target for 1983/84 was 2.2 million spindles.

Synthetic fibre production began during the 1970s. Indonesia now produces some polyester staple fibre, nylon filament, polyester filament and texturised filament. Nylon staple fibre, rayon filament, acrylic and others are not yet produced. Rising demand for synthetic fibres has led to the establishment of several new factories in recent years. As of 1980 there were eight synthetic fibre plants in operation, six in West Java and two in Central Java. The number of texturising plants (fine weaving yarn made by twisting and thermosetting polyester and nylon filaments) rose from 5 in 1970 to 45 in 1980. Present production capacity for synthetic fibres is as follows:

	Tons/day
Nylon filament	33
Polyester filament	180
Polyester fibre	136
Rayon (under construction)	45

Weaving is by far the largest sub-sector of modern textile yarn and fabric production. In terms of technology, the weaving sub-sector falls into three categories:

(i) About 90 large weaving enterprises with 19,200 automatic looms, i.e. an average of 210 looms per enterprise;

(ii) Some 1,500 smaller enterprises using some 75,000 power looms, i.e. an average of 50 per enterprise;

(iii) About 5,000 enterprises, mainly cottage industry, which produce textile fabrics using predominantly hand looms.

In knitting, 52 large enterprises are engaged, producing in considerable part for the export market.

In garment manufacturing, there are some 65 large enterprises (150 sewing machines or more), some 200 medium-sized enterprises and an unknown number of small enterprises.

Table X.2 shows census data for employment in the textile industry in 1980. Census data (which have many deficiencies) indicate that between 1970 and 1980 total employment in the textile industry grew by 87,400 persons, i.e. by only 19 per cent, or at an annual rate of 1.75 per cent. This was well below the rate of growth of Indonesia's labour force, despite the very rapid growth of output. The main explanation is the displacement of labour in the small-scale and handicrafts sector.

Table X.2. Employment in textile industry (spinning, weaving, garment) 1980

	Unskilled	Skilled	Total
		- Number -	
Spinning	86,118	343	86,461
Weaving	108,323	167	108,490
Garment making	65,678	82	65,760
TOTAL	260,119	592	260,711

Source: Bureau of Statistics

Virtually all the raw materials and many other production inputs into the textile industry are still imported. Cotton imports (Table X.3) rose to nearly 120,000 tons by 1980. Domestic production of raw cotton amounts to only 6,000 tons a year. While there are plans to expand cotton production in the near future, Indonesia will continue to depend on imports for most of its raw cotton requirements. Rayon and synthetic fibres are also still predominantly imported. Rayon imports rose from an average of 31,000 tons per annum in 1978/79 to 40,000 tons in 1980/81. Thanks to increased local production, imports of synthetic fibres remained relatively stable at about 25,000 tons a year.

Table X.3: Cotton imports, 1975-1980

Year	Volume '000 tons	Value US $ Mill.
1975	89.4	103.2
1976	64.1	84.4
1977	65.7	101.2
1978	90.9	118.9
1979	150.5	130.0
1980	116.9	182.5

Source: Bureau of Statistics.

Considerable efforts have been made in the past decade to develop an export trade in textiles, chiefly garments but also some fabrics. In 1979, textile exports for the first time exceeded textile imports in value (Table X.4). The 1979-80 export boom was not sustained, but there are hopes that, under the stimulus of the March 1983 devaluation of the rupiah, textile exports will resume an upward trend. Under the Multi Fibre Agreement, Indonesia has been given a quota of US$ 140 million annually, a figure which has yet to be reached.

Table X.4: Imports and exports of textile fabric and garments, 1975-1980.

Year	Total Import		Total Export	
	Volume mill m	Value mill US$	Volume mill m	Value mill US$
1975	157.3	52.7	n.a	n.a.
1976	103.4	65.9	8.3	5.5
1977	117.4	57.1	8.3	5.7
1978	130.0	66.5	26.4	18.3
1979	203.7	76.2	68.1	99.3
1980	247.8	129.0	62.6	124.8

Source: Department of Industry

10.1.2 Future Prospects

Tables X.5 to X.7 show Repelita IV targets for production, export and apparent consumption of yarn, fabric and garments during 1984-88. The planned average growth rate for production of yarn is 3.4 per cent per annum, for fabric 3.8 per cent and for garments 12.4 per cent. Synthetic fibre and cotton requirements are shown in Table X.8, with a growth rate of 3.6 per cent. Almost one-half of garments production will, it is hoped, be exported. Projected exports of yarn and fabric are quite small.

Table X.5: Projected production, imports, exports and apparent consumption of yarn, 1984-1988
(000 bales)

Year	Production	Exports	Apparent Consumption
1984	1,845	3	1,842
1985	1,909	2	1,907
1986	1,966	1	1,965
1987	2,038	2	2,036
1988	2,109	3	2,107

Source: Directorate General, Multifarious Industries.

Table X.6: Projected production, imports, exports and apparent consumption of fabric, 1984-1988
(million m)

Year	Production	Exports	Apparent Consumption
1984	2,306	36	2,270
1985	2,404	64	2,340
1986	2,470	70	2,400
1987	2,556	76	2,480
1988	2,670	120	2,550

Source: Directorate General, Multifarious Industries

Table X.7: Projected production, imports, exports and apparent consumption of garments, 1984-1988
(million pieces)

Year	Production	Exports	Apparent Consumption
1984	170	47	124
1985	185	56	128
1986	209	74	134
1987	211	71	140
1988	269	124	145

Source: Directorate General, Multifarious Industries.

Table X.8: Projected requirements of rayon, polyester and cotton, 1984-1988
(000 tons)

Year	Rayon	Polyester	Cotton
1984	66	104	217
1985	69	109	223
1986	71	112	230
1987	73	116	238
1988	75	119	248

Source: Directorate General of Multifarious Industries; for cotton: Directorate General of Estates.

10.2 Processing (n.a.)

10.3 Equipment production in Indonesia

10.3.1 The present situation

There is some production of equipment, spare parts and components for the textile industry, primarily for small and medium scale enterprises. Simple looms are produced domestically, also some weaving machines. But their quality is such that little if any of it can be used in the modern sector. Textile machinery for the modern sector is imported, mainly from Japan, but also from some European countries and from the People's Republic of China.

There is some production of castings in Ceper and Yogyakarta; no data are available on output. While there is also some production in Indonesia of spare parts and components, its magnitude is difficult to gauge because much of it is sold under foreign brand names, since imported products find a more ready market. Domestic products certainly have a substantial price advantage. Indonesia weaving shafts, for example, sell for approximately US $6-10 as compared with US $10 for Chinese, US $15 for Japanese and US $20 for European products. The same applies to shuttles; domestic production sells for US $4 a piece (plastic), while the same material from the Province of Taiwan sells for US $5 and hard wooden shuttles from Japan cost US $3-6. Cutting knives for weaving machines are produced in Indonesia by cottage industries, stamped out of Swedish steel and sharpened with a sharpening and polishing machine. They sell for US $5 a piece, but their quality is not comparable to those imported from Japan (up to US $14) or Europe (up to US $20).

10.3.2 Future prospects

The rate of technological progress in textile machinery, especially the development of shuttleless weaving and more generally automated production for integrated plants, is such that the technological gap between highly industrialised and developing countries, which narrowed during the 1950s and 1960s, is again widening. The most modern equipment is so costly and employs so little labour that is is, *prima facie*, inappropriate for countries with Indonesia's factor proportions; yet output from these modern plants may well be price as weel as qualitative competitive with labour-intensive production from low-wage countries. The problem for industrialising developing countries, such as Indonesia, is to find the best strategy for textile equipment production in these circumstances.

One option is to focus specifically on the equipment needs of the small-scale and handicrafts sector which cannot be allowed to disappear because the livelihood of 2-3 million people depends on it and whose economic survival could be helped by mass production of good-quality cheap equipment. A second, not mutually exclusive option, is to ignore the most advanced technology as being beyond Indonesia's reach at this stage and secure equipment for the weaving industry by importing second-hand power looms from countries which are discarding them in favour of more advanced equipment. From a strictly economic point of view, such redeployment may well be the best course for the short or medium run, but it makes little appeal to planners who seek to raise the country's industrial and technological capacity in the longer run. A third option is to follow in the footsteps of the previous generation of industrialising countries, such as Brazil, India or Romania, by embarking in gradual stages on domestic production of equipment for the modern textile industry. Owing to the technological complexity of most such equipment, and the need to achieve adequate quality if the user industry is to be competitive, particularly in export markets, domestic production will require technological and possibly financial cooperation with overseas machinery producers. There is an obvious case for beginning with a few machines, starting with assembly and gradually increasing the local content.

In Indonesia, textile machinery production might well begin with assembly of cotton spinning machines including draw frames and (for the small-scale sector) hank winding machines (used to wind the yarn in the form required for dyeing. Assembly and increasingly local production of automatic conventional shuttle looms, under licencing agreements, might follow. Domestic production of other machines should be deferred to a later date when technological experience gained and development of the domestic machinery market are more likely to permit economic production.

Scope for local assembly and increasingly local production may be put at (say 285 machines (US $74,000 each) or US $21 million per annum for ring spinning machines, and 200 machines (US $10,000 each) or US $2 million per annum for hank winding machines. Output of draw frames may be of the order of US $3 million a year. This gives a total of US $26 million for spinning machinery. The investment required in new capacity for assembly and gradual production is in the order of US $15-20 million. Employment creation might be put at 1,000 new jobs.

In view of what was said above about the uncertainties surrounding the future of weaving industry development, it would be inappropriate to make even the most tentative estimates of potential domestic production of weaving machinery. A detailed sub-sectoral analysis is needed.

10.4 Investment Implications (n.a.)

10.5 Recommendations

There is a prima facie case for the gradual development of local production of textile machinery in Indonesia, but any considered recommendations presuppose more thorough study of a range of complex problems than has been possible for this study.

Of the wide range of machinery required by the modern sector of the industry, ring spinning and hank winding machines probably lend themselves best to domestic manufacture, beginning with assembly and gradually increasing local content. Local production of draw frames may also be technically feasible. Any such development should enlist the knowhow and perhaps financial cooperation of established overseas machinery producers.

On all other aspects of the development of local production of textile machinery, especially for the weaving sub-sector of the modern textile industry and for the small-scale and handicrafts sector, detailed sub-sectoral studies are desirable.

Chapter XI. Conclusions and Recommendations

11.1 Aggregate estimates of technically feasible domestic production

The preceeding chapters describe in broad terms the investment, output and employment implications of local production of processing equipment which appears technically feasible. The estimates made on various assumptions yield a total potential, in this sense, as follows (Table XI.1):

- (i) Total annual investment during Repelita IV in equipment for the seven processing industries excluding textiles approximately US$ 925 million; of this
- (ii) annual technically feasible local production of processing equipment approximately US $470-560 million;
- (iii) investment required in additional capacity for processing equipment production US $330-360 million;
- (iv) employment generation in equipment production: 21,000-23,500 jobs.

These are very tentative estimates, subject to many uncertainties which require clarification before any firm judgements can be made. One of the most important facts to be established is the volume of effective excess or idle capacity in established processing and equipment producing industries. There are strong indications that a significant amount of equipment could be produced by increasing capacity utilisation through improved information flow between potential purchasers and suppliers and by strengthening the engineering and production management capabilities of domestic equipment producers. Such additional production would require only marginal additional investment.

Table XI.1 also indicates the wide differences in the magnitude of potential capital goods demand among the various sectors. The requirements of estate crop processing (cocoa, coffee, tea) and probably also rubber processing (where capacity utilisation, replacement and new investment demand figures could not be established) are very much smaller than those of the other sectors. By far the largest potential is represented by the wood processing sector. If massive employment creation were to be promoted by an equipment production programme, this sector, which could generate employment

Table XI.1: Tentative estimate of investment in equipment production and employment generation

Equipment Demand Sector	Annual demand for equipment by demand sector (US $ million) 1984-1989	Technically feasible annual domestic equipment production (US $ million)	Investment in equipment production capacity (US $ million)	Employment generation (thousand persons)
Coconut and palm oil	103[a/]	90	60	4,000
Rubber	-	-	-	-
Sugar	110	78	50	3,000
Cocoa, coffee, tea	7	5.6	3	250
Wood processing	450	200 (Stage I)	150	10,000
		240 (Stage II)	165	11,000
		290 (Stage III)	180	12,000
Cement				
(new investments)	200[b/]	62	50	1,500-2,000
(spare parts)	8	8	5	200

a/ Of which 90 percent for palm oil extraction
b/ On a long term basis there is an additional domestic production potential of US $30 million for heavy machinery.

in the order of 10-12,000 persons, would deserve priority. At the same time, enormous investment, technology transfer and manpower training would be needed to achieve the desired results.

In terms of employment creation potential through equipment production, wood processing is followed by edible oil (4,000), sugar (3,000), cement (2,000) and textiles (1,000). These four sectors together have about the same potential for employment generation as the wood processing sector. If Indonesia succeeded in mastering the highly complex technology for assembly and gradual production of textile machinery, employment generation in this sector might be higher than indicated. But it should once more be underlined that this task will require enormous efforts. In terms of employment, as well as overall economic growth and welfare, the net benefits would be negative if high cost and poor quality equipment imposed additional handicaps on the processing equipment using industries.

11.2 Recommendations

Table XI.2 presents a list of selected items of equipment or equipment production facilities which are recommended for further consideration for local manufacture. The list should be regarded as one of "most promising candidates", in the sense that their technical feasibility seems more assured than that of other machinery and equipment required by these industries.

While the equipment requirements of each demand sector have their own peculiarities and require specific approaches to the development of the corresponding engineering industries, there are some measures which are of a general character and more or less common to all demand sectors. The last column of Table XI.2 summarises recommendations for follow-up action which would be necessary if development of production facilities for the equipment were considered. Such follow-up action falls into six major areas:

1. Strengthening the existing equipment producers or industries with potential for the production of equipment. The field mission identified deficiencies mainly in production management (planning, preparation, execution of works and control), engineering and design, quality control and manpower capabilities. Such measures are especially recommended for producers of equipment for the edible oil extraction, cocoa, coffee, tea and wood processing industries (parts and components).

2. Promotion and implementation of the "integrated approach". The processing plants for sugar, cement, edible oil refining, saw milling, plywood and fibre board manufacture are generally commissioned on a turnkey basis. The general contractor is an engineering company which normally sub-contracts part of the equipment to be installed and, if it has no production facilities of its own, all of it. Indonesia has gained valuable experience in the sugar industry where in the past a foreign general contractor has been required to co-operate in equipment production with an Indonesian firm as affiliate. The experience gained now enables the Indonesian enterprise to switch roles with the international partner and become the main contractor.

Table XI.2: Summary of recommendations

Demand sector	Equipment recommended for production	Special measures recommended	Other recommendations for follow-up action
coconut and palm oil processing	oil extraction: hammer mills, screw presses oil refining: equipment as being determined through "integrated approach"	oil refining: "integrated approach" is recommended	1) oil extraction: strengthening of existing industries through production management, engineering and design support and manpower training programmes 2) oil refining: special technical assistance to "integrated approach"
rubber			3) analysis of existing enterprises to determine future equipment and spare part demand 4) feasibility study on intermediate rubber product manufacturing and equipment production for powdered rubber production
sugar	extension of local content from 60 to 70 per cent of value of equipment	continuation of "integrated approach" determination of additional equipment for local production should emanate from this approach)	special technical assistance to "integrated approach"
cocoa, coffee, tea	3 types of machinery for cocoa 6 types of machinery for coffee 10 types of machinery for tea		1) sub-sectoral analysis of equipment producers, determination of economic viability and manpower training and technology requirements of additional equipment production 2) same as No. 1 oil extraction
wood processing	dryers, parts of saw mill installation (up to 50 per cent local content) gradual increase of local content for plywood and fibre board equipment (from 30 per cent, over 45 per cent to 60 per cent) type of equipment as being determined through "integrated approach" woodworking machinery: band saws, circular saws, planing machines, milling machines	"integrated approach" recommended for saw milling, plywood and fibre board equipment	1) sub-sectoral analyses leading to the determination of feasibility of production of woodworking machinery, dryers, spare parts and components 2) special technical assistance to the "integrated approach" 3) analysis on improvement of the ratio of cut tree utilisation vs. waste wood, including build-up of additional small scale wood industries
cement	spare parts; castings, especially grinding balls equipment: type of equipment as being determined through "integrated approach"	"integrated approach" recommended	1) special technical assistance to the "integrated approach" 2) same as no. 1 of cocoa, coffee, tea.
textiles	ring spinning and hank winding machines, draw frames, possibly later: dyeing equipment, measuring, inspecting, sizing and rolling machines		1) establishment of economic viability and industrial cooperation promotion for ring spinning and hank winding machines 2) sectoral analysis to determine techno-economic feasibility of production of other textile machinery and equipment

This integrated approach to the establishment of processing plants should be extended to the other industries mentioned above. UNIDO recommends a tehnical assistance programme for this purpose. A major activity of the programme, in close co-operation with the Ministry of Industry and the relevant industry associations, would be to prepare the domestic industry to participate in tenders and to determine technical and economic feasibility of domestic production and the degree of achievable local content.

3. Feasibility studies or sub-sectoral analyses to determine the economic, as well as technical, feasibility of domestic equipment production in the areas tentatively recommended. Feasibility studies for specific products are recommended for intermediate rubber product manufacturing and domestic equipment production for powdered rubber, and for ring spinning and hank winding machines. Sub-sectoral analyses which aim in the first instance at identifying selected products suitable for feasibility studies are recommended for the machinery and equipment required by the cocoa, coffee and tea, textiles and wood-working industries and for driers and spare parts for wood processing.

4. Promotion of industrial co-operation. The level of technology involved in the production of equipment indicated for domestic production requires in many cases co-operation with a foreign know-how partner. In some cases, a joint venture approach will be more appropriate than other forms of enterprise. UNIDO recommends a specific programme to undertake the promotion of industrial technology transfer through know-how agreements and of joint ventures with appropriate foreign partners.

5. Training of manpower. While there has been a significant improvement in the pool of relatively skilled manpower in Indonesian manufacturing industry in the past twenty years the demands that would be made by an extensive programme of capital goods production would be high, large and novel. Any measure for the development of such industries and for technical assistance to management should be paralleled by ambitious programmes for manpower training, whether in vocational training institutions or through incentives given to managements in existing firms.

6. Regional complementation arrangements within ASEAN. Several of the industries considered in this chapter, especially rubber, timber, sugar, palm and coconut oil processing and textiles are important in other ASEAN countries as well as in Indonesia, and it is very likely that plans to develop domestic equipment production industries are going on simultaneously in several of these countries. For example Malaysia is already the World's largest exporters of rubbers and palm oil processing machinery.[1/] There is an obvious case for consideration, within existing ASEAN complementation arrangements, of the possibility of co-operation among industries of two or more countries so that local equipment production can reap the economies of scale to be obtained from production for a wider regional market.

The six priority areas for follow-up action outlined above may lend themselves to being considered for UNIDO technical assistance.

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1/ UNIDO: Capital goods industry in Southeast and East Asia by Associate Professor Chee Peng Lim, University of Malaysia, Kuala Lumpur, October 1983 (draft).

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INDONESIA INDUSTRY SECTOR STUDY *

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INDONESIA

Part VI Capital Goods Production in Developing Countries: International Experience

Prepared by the

Regional and Country Studies Branch
Division for Industrial Studies

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The UNIDO INDONESIA INDUSTRY SECTOR STUDY comprises the following six parts:

Part I	Main Report
Part II	Industrial Development in Indonesia - Past Trends and Future Prospects
Part III	Survey of Capital Goods and Engineering Industries
Part IV	Long-term Projections of Demand for Capital Goods in Indonesia
Part V	Potential for Development of a Selective Capital Goods Industry
Part VI	<u>Capital Goods Production in Developing Countries: International Experience</u>

THIS DOCUMENT CONTAINS PART VI.

Part VI Capital Goods Production in Developing Countries: International Experience

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Part VI. Capital Goods Production in Developing Countries: International Experience

This Part begins with an overview of international trends in trade, production and consumption of capital goods. It then focuses more specifically on Latin American experience and on two particularly interesting cases: the role of multinationals in Brazil and of technological innovation in the Republic of Korea. The third chapter of examines a range of problems that have been encountered by developing countries at the micro level.

Chapter I. Experience at the macro level

1.1 International trends in capital goods

1.1.1 International trade

Annex Table 1 presents a summary picture of world trade in engineering products in 1978. Not surprisingly, the developed market economies dominate the scene, accounting for 88 per cent of exports and 60 per cent of imports. The USSR and other developed socialist countries account for another 10 per cent of more or less balanced trade. The developing countries are overwhelmingly net importers, with 30 per cent of imports but only 2.6 per cent of exports.

Annex Table 2 shows that, between 1970 and 1978, the developing countries raised their share in world trade in engineering products only marginally, but in absolute terms their exports of engineering products increased almost tenfold, to US $9.4 billion. As in the case of the developed countries, a relatively small number of developing countries account for the bulk of export trade in engineering products. As Annex Table 3 shows, only six developing countries recorded exports of machinery and transport equipment in excess of $500 million in 1979: Singapore, the Republic of Korea, Hong Kong (1978), Brazil, Yugoslavia and Argentina (1978). More than one-half of the exports of the three leading exporting countries fell into class 71 (electrical machinery) and consisted chiefly of electronic components and products, although the Republic of Korea has been developing rapidly as an exporter of other machinery. More than 50 per cent of their exports went to the developed market economies. Brazil and Argentina have become significant exporters of non-electrical machinery and transport equipment, in Brazil's case at a level comparable to those of several OECD countries.

1.1.2 Production and consumption

In addition to the trade statistics to which reference has been made, Annex Table 3 provides data on value added, number of employees, gross output and the domestic procurement ratio in the production of machinery and transport equipment for the 46 developing countries which collectively account for virtually the whole output of capital goods in the Third World. Seven countries, those in Group I, account for almost 90 per cent of total gross output. They meet approximately 60 per cent of their requirements from domestic production and have substantial, though widely varying, export ratios. Group II includes traditional (e.g. Argentina, Colombia, Chile, Egypt) as well as new capital goods producing countries with domestic procurements ratios in excess of 40 per cent or (as in the cases of Hong Kong and Argentina) substantial export ratios. Among them are two ASEAN countries, the Philippines and Thailand (no figures for Thailand). Indonesia, with all the rest, is classified in Group III, mostly with domestic procurement ratios of less than 25 per cent and little if any export of engineering products.

Annex Table 4 provides more detailed data on the capital goods industries of selected developing countries. Tanzania represents the large number of developing countries with virtually no capital goods sector and limited prospects, as indicated by very small imports (and presumably domestic consumption) of capital goods and shortage of skilled labour. Thailand and Peru appear as newly emerging capital goods producers, each with over 1,000 establishments and a significant core of scientifically or technically trained personnel. By far the largest domestic producers of capital goods among developing countries in terms of number of establishments and employees are the People's Republic of China and India, but Brazil surpasses India in value of gross output, apparent consumption and exports (no trade figures for the Peoples Republic of China are available). In Brazil, capital goods already account for 29 per cent of exports of manufactures, as compared with only 19 per cent in the Republic of Korea. Brazil had the advantage of a long prior period of engineering industry development for the domestic market, but the Republic of Korea has been rapidly catching up from a starting point of export-oriented industrial development concentrated initially on consumer goods.

Annex Table 5 provides data on growth of engineering value added in Asian countries. It confirms the predominance of India but also brings out the remarkable ascendance of the Republic of Korea and Singapore, with annual growth rates even during the second half of the 1970s of over 25 per cent.

1.2 Latin American Experience

In the years after World War II, much of Latin American embarked on a deliberate policy of industrialization based on import substitution, in the belief that manufacturing industry could serve as the dynamic engine of growth, creating employment for rural surplus labour, absorbing modern technology, reducing dependence on world markets for primary products and on imports of manufactures and thus overcoming chronic balance of payments problems. By the end of the 1950s, the most influential exponent of this strategy, Dr. Raul Prebisch, had come to the conclusion that the strategy was largely failing to achieve the hoped-for objectives. Import dependence was not being reduced, unemployment was not being significantly alleviated, balance of payments problems remained. He concluded that Latin American countries had to seek export markets for manufactures. His first approach was to recommend schemes of regional integration, to expand the horizons of manufacturers from domestic to regional markets, but none of these schemes (LAFTA, CACM, Andean Group) proved very successful. In his proposals for UNCTAD I he emphasised the need for developing countries to look to the large and growing markets of the advanced industrial countries and urged the latter to assist through preferential trading schemes. Some Latin American countries, especially Brazil, have followed this strategy with considerable success. The majority have continued to rely in their industrial development primarily on production for the domestic markets. Both the less and the more export-oriented Latin American countries, however, in contrast to the east Asian NICs, have from the beginning put considerable emphasis on engineering industries and domestic production of capital goods.

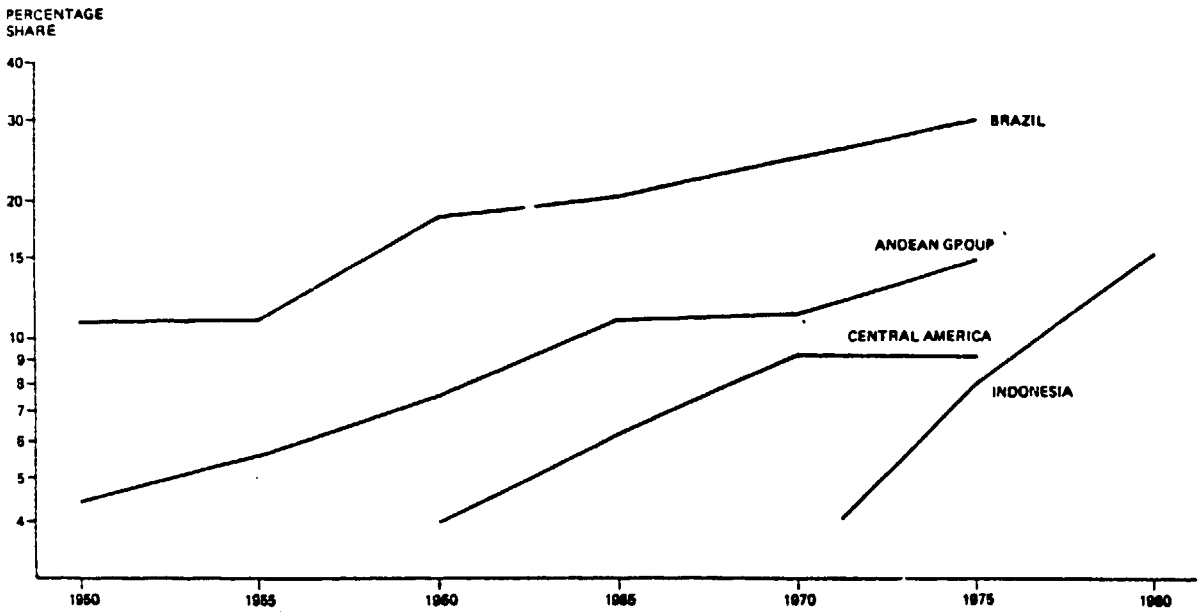
Along with sustained, though not very rapid, growth of total industrial production (annex table 6), averaging 6.3 per cent a year over the period 1960 to 1980, there have been considerable changes in the structure of manufacturing industries in Latin American countries. Annex Table 7 shows that, while in 1950, production of non-durable consumer goods accounted for almost two-thirds of industrial value added (food and beverages alone accounting for one-third), by 1977 their share had fallen to little more than one-third. The share of engineering industry (ISIC branch 38) had risen from 11 to 25 per cent, the value added of the chemical (other than petrochemical) industry form 5 to 15 per cent, and basic metals (iron and steel and non-ferrous) from 4 to 9 per cent. Within the engineering branch, the largest increases in relative shares were recorded by the electrical machinery (from 1 to 6 per cent) and transport equipment (2 to 8 per cent) sub-sectors. Data are not available to indicate what proportions of output consisted of consumer durables and capital goods.

Annex Table 8 and Figures I and II give a further breakdown of the engineering industries of three sub-regions, Brazil, the Andean Group countries and Central America. All three groups show a gradual increase in the relative importance of engineering industry, with Brazil most and Central America least advanced. Whereas in Brazil the share of the engineering industry had already passed 15 per cent by 1960, it did not reach this figure in the Andean Group until 1977; similarly, the share in the Andean Group had passed 10 per cent by 1965, a figure not yet reached in Central America in 1975. Among sub-sectors, tranport equipment moved ahead of others in Brazil in the 1970s, followed by non-electrical machinery (the sub-sector containing most capital goods). In the other two sub-regions, fabricated metal products still recorded the largest share in 1977.

These figures reflect the fact that Brazil's dynamic growth in engineering industry has relied heavily on development of its automotive sub-sector. The Andean Group have also sought to develop automotive production beyond mere assembly of passenger cars but as yet with indifferent success. The prospects for any such development in Central American are meagre, since the minimum scale of production is far larger than the small domestic market and realistic export prospects combined.

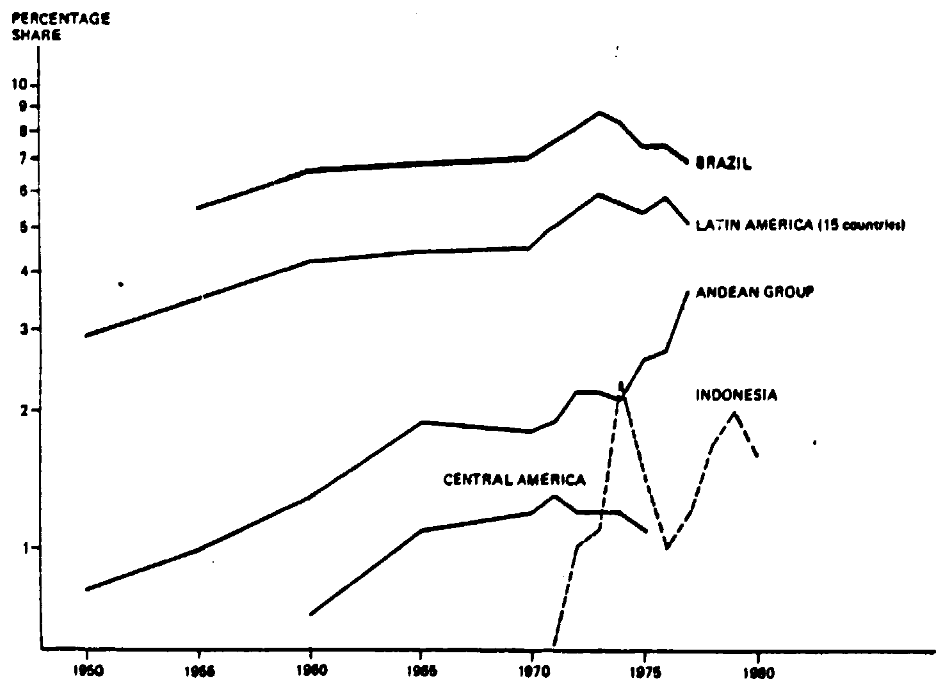
Latin American governments have all given high priority to industrial development of one kind or another and have sought to pursue this objective with a variety of industrial policies, including various forms of promotion such as, protection and support activities, including investment in infrastructure, technical education, development finance, and in varying degree in different countries also more direct intervention by the state

Figure I: Share of Engineering Industry (ISIC 38) in Total Manufacturing, Value Added, 1950-1980



Source: UNIDO (based on Annex Table 8).

Figure II: Share of Non-Electrical Machinery (ISIC 382) in Total Manufacturing, Value Added 1950-1980



Source: UNIDO (based on Annex Table 8).

acting as entrepreneur or as buyer of industrial products. Direct state ownership has been important in steel production (accounting for 60-100 per cent in Argentina, Mexico, Brazil, Chile, Venezuela and Peru) and in petroleum refining and petrochemicals in most of these countries. But governments have generally refrained from competing with the private sector in most other branches of manufacturing, except in instances where governments have taken over weak companies to maintain employment. The role of foreign investment by multinationals has been contentious, but most countries have seen the need for their participation in industrial development requiring high technology, large investments and efficient management.

Because of the importance of the role of multinationals and technological innovation in engineering development, it is instructive to look at two case studies, the first from Latin America, the second from east Asia.

Chapter II. Two case studies

2.1 The role of multinationals: Brazil

Transnational companies in Brazil have a production share of 46 per cent in the capital goods sector and 56 per cent in durable consumer goods. Both figures are far higher than for the other two major branches of engineering industry, production of intermediate products (35 per cent) and non-durable consumer goods (16 per cent). The difference is largely explained by the advantage which multinationals enjoy in advanced technology and access to export markets. Both of these are of greater importance in automotive and electrical machinery production than in other branches of manufacturing (if allowance is made for the major role of state enterprise in steel and petrochemical production).

Annex table 9 shows that capital goods production accounted for 41 per cent of investment by multinationas but for only 35 per cent of the number of multinational enterprises, indicating the relatively large investment per company in capital goods production. Again, this applies particularly to the transport equipment sub-sector, and to a less extent to electrical and telecommunications equipment production. In both sub-sectors, the 10 largest companies account for 60-80 per cent of multinational turnover, compared with less than one-half in the mechanical equipment sector which shows a significantly smaller average investment per enterprise. The relatively large number of enterprises in this sub-sector reflects in part the wide and diversified range of products.

2.2 Technological innovation: Republic of Korea

Korean production of capital goods began in 1960 with legislation to establish shipbuilding, motor vehicle, general machinery and electronics industries. During the 1970s further policies were adopted to expand machinery production, including a scheme to promote the heavy electrical machinery sector, a plan to develop machine tool and textile and agricultural machinery industry, the selection of 85 key kinds of machinery and of 35 types of specialized machinery for early development, the designation of 72 small machinery makers and a second long-term plan for the machinery sector. These measures were in most cases accompanied by low-interest finance and tax concessions. An Institute for Machinery and Metals, was established to upgrade the technical capability of Korean machinery industries.

Between 1960 and 1975 the share of the machinery industry in total manufacturing output doubled, with an average annual growth rate of 21 per cent, as compared with 13 per cent for manufacturing as a whole. This growth performance is attributable in large degree to the incentives provided by government to create a technology base for the machinery industry. In 1979 the Korean Government took further steps to facilitate the development of industrial technology in the capital goods industry. Capital goods developed by 70 enterprises were designated as "Newly Developed Innovative Machines" (NDIM) and special incentives offered for their production and purchase. The criteria used in designating NDIMs included:

1. the NDIM must have been developed with local patents or with a new technology;

2. local components content must be at least 60 per cent;

3. the NDIM must have been developed in Korea without technical co-operation from abroad;

4. the quality must be certified by an independent quality inspection laboratory;

5. the NDIM must not be an exact copy of a foreign product;

6. no foreign components must be used for critical functions.

In other words, the objective was to promote local technological innovation in the capital goods industry.

A sample study of innovative entrepreneurs under the scheme showed that 85 per cent of them consisted of small- and medium-sized companies. This finding corresponds with similar findings in other industrializing countries suggesting that small companies tend to respond more flexibly to opportunities for innovation. Approximately two-thirds of the technological innovations arose in response to market needs and only one-third from more technical feasibility. In more than half the cases, the innovative company had outside technical assistance, either from research institutions or from potential users of the product. In most cases, catalogues and technical descriptions compiled by foreign machine producers were drawn upon for guidance.

The Korean case study underlines the importance of government incentives, market demand and technically competent and innovative entrepreneurs as necessary ingredients in the environment needed for the development of an indigenous technological capability in specific areas.

Chapter III. Experiences at the Micro Level

3.1 Introduction

This part draws on the experience of selected newly industrialised countries (NICs) in producing capital goods and examining the problems experienced in association with such production. Capital goods are defined here to comprise industrial and agricultural machinery but excluding vehicles and electrical equipment. The selected group of NICs includes: Argentina, Brazil, India, the Republic of Korea, Mexico, Pakistan and the Province of Taiwan. Although the evidence is still far from systematic or conclusive, many of the issues raised are important.

Developing countries embark on the production of capital goods for a variety of reasons but four among them seem to assume special importance: the comparative advantage accruing from low costs of skilled labour; the capacity to produce machines embodying specifications and designs appropriate to their countries' factor proportions; the prospect of externalities (spin-off) from the capital goods sector to increase the efficiency of the entire manufacturing sector and economy; and to ensure a steady and realiable supply of this critically needed factor of production.

Indonesia's policy-makers have embarked on a strategy to adjust the manufacturing sector's structure of production by undertaking to produce the capital goods requirements of processing industries. To survive, the programme to produce capital goods domestically must be cost efficient. Thus, the considerations of cost efficiency are discussed first.

3.2 Cost Considerations

To describe and analyse the costs of production in the capital goods producing sector, we draw on the recent experience of the principal producers among developing countries: Argentina, Brazil, India, the Republic of Korea, Mexico, Pakistan and the Province of Taiwan. We consider both the producers of equipment and their suppliers in the metal products sector, particularly foundries and forges. Iron and steel operations are excluded, although costs of these products can drastically influence the cost of capital goods.

The typical experience of capital producers in developing countries suggests that the correct use of skilled labour can be as important in reducing costs as the optimal use of equipment. Thus, the competitiveness of developing countries in capital goods production is contingent on maintaining high productivity on individual tasks; alternatively, factor prices or material costs must be sufficiently low to offset firmwide productivity differences. These considerations will be addressed in terms of: the productivity of workers on tasks; the productivity of whole plants; the sub-contracting network; the record of some supplying sectors, and policies of government.

3.2.1 Task-Level Productivity.

Although skilled operatives in developing countries receive lower wages than those in developed countries, the obvious question is whether labour productivity is proportionately lower, allowing for the smaller quantity of capital per worker, and thus nullifies the wage differentials. Two aspects of labour productivity need to be distinguished. The first is the number of items produced per minute by a worker on a set task, assuming all complementary inputs are available, machines in good order, and so on. The second is output per operating day, which depends on the first aspect and also on the rate at which complementary inputs are made available, the frequency of mechanical failures not attributable to the operative, the time the operatives spend moving materials among work stations, the number of different tasks assigned to each worker, their respective set-up times, and so on.

Most observations of factories operating in NICs indicate that the performance of operatives on tasks is rather high, despite the use of less sophisticated machinery. In many activities their performance equals that of factory workers in developed countries, and it is rarely less than 30 per cent of their level.[1/] Productivity on a plantwide basis, however, is often much lower. In India, for example, labour productivity in the textile-machinery sector was estimated at a third of that in European countries in the best firms and, at a tenth in the worst. Similarly, a study in the Republic of Korea of the entire mechanical engineering sector found labour productivity to be 20 to 30 per cent of that in Britain and the United States, whereas wages were less than 10 per cent of those in Britain and the United States.

1/ Among the studies relevant to this issue are that on Machinery industries in the Republic of Korea (World Bank, 1978), and those for Foundries in India (World Bank, 1974), and The textile machinery in India (World Bank, 1975).

Lower productivity at the task level in the NICs, when it was observed, was attributed to a number of causes: inadequate instruction about the potential effectiveness of a machine tool; poor working conditions such as clogged floor space on which to begin a job; the use of poor quality tools; the absence of technical aids to operatives; and the failure to use jigs and fixtures in setting-up operations.[1/]

Indonesian planners need to distinguish here between those aspects which reflect a movement along a production function in response to a low wage-rental ratio (the use of poor quality cutting tools and the absence of jigs) and those that result in a failure to reach the production function due to X-efficiency (e.g. misestimation of a machine's potential). This distinction is not easy, but it is quite relevant, for the first group probably reduces production cost, whereas the second group increases them.

Although the quotation below is taken from a study about the Republic of Korea,[1/] similar examples are found in descriptions of other countries.

> In the best-run Western machinery and metal working establishments, there is an abundance of technical material available to the machine operator and the first-line supervisors. These materials take the form of wall charts, tabular materials, condensed handbooks of technical information, etc., all of which are designed to assist the man in making proper measurements, making conversions from one type of system to another (e.g., English measures into metric), to choose the right feed and speed for the machine based on the type of material being worked and the type of operation, and a variety of other technical information to assist in day-to-day standard operations in the plant. This kind of material was noticeably lacking in the plants visited. There is, of course, a good deal of documentation available to the front office management, the plant engineer, the production manager, etc., on the characteristics, design, functions, speeds and feeds for the specific machines in the shop, but that kind of information is at a different level from the kind being described here, which is standardised technical information that is necessary on the shop floor so that the operators and first-line supervisors will not have to do standard calculations, nor make guesses than can lead to mistakes when there is a simple way to look it up.

1/ See Machinery industries in the Republic of Korea (World Bank, 1978, Chapter 3).

3.2.2 Plantwide Productivity.

Plant layout and scheduling have significant impacts on productivity. Since in many machine-producing activities neither the order nor the placement of machines is inherent in the process, difficulties are raised by this wide latitude of choice, particularly for the NICs machinery industries. The typical plant in Mexico, Brazil or India exhibits a poor layout in which the movement of the work in process interferes with operations at the different work stations, so that an accumulation of partly finished pieces is held until workers return to them. Poor scheduling is also noted. In a study of forging in India[1/] it was observed that such poor scheduling had resulted in reduced use of labour and equipment, in delays in identifying and correcting errors and in high interest charges on carrying substantial semi-finished inventories.

A general characteristic of production of machinery in most of the NICs is low capacity utilisation. Mechanical engineering plants usually employ a number of costly individual items, such as machine tools, fixtures, and welding equipment. Each can be fully utilised if a plant produces a large batch of items of a single type or a range of products that require a similar operation such as stamping. At low volumes of output low utilisation rates are unavoidable. This problem will become (and has already become) less severe with growth of the domestic market and, as efficiency and marketing ability increase, with the growth of exports.

Materials management is a related area to be monitored. In Indian foundries it was often found that scraps and castings were not returned to their proper place for storage and that sand accumulating on the floor was removed only when little working space was left. The same phenomenon was observed in the Republic of Korea, Egypt, Mexico and Brazil. In an example from the Republic of Korea the World Bank reports "...as much as 50 per cent of the total floor area (was) occupied with heaps of discarded sand which had been knocked away from pervious castings."[2/]

Here is another description of the effects of poor scheduling on labour productivity:[3/]

> The common pattern was one of machine placement that is haphazard rather than allowing for an orderly flow of work. Floor space is very crowded and the operation

1/ Steel forging in India: World Bank 1974
2/ Machinery industries in the Republic of Korea 1978 (p.67)
3/ Machinery industries in the Republic of Korea 1978

of machining, fabrication of components, assembly of parts are scattered in any place that happens to have available room. Too much time is spent finding work, or the next job, or material. In some cases the men have to find their own area in which to work, perhaps make up some form of fixtures of their own, or find the means to obtain levels or measurements to work from. The almost universal characteristic is one of congestion and a mixing of operations that frequently leads to deterioration of quality because of improper floor planning. There is no adequate provision for working space around the main machines and the aisle-ways that are normally used to carry the flow of work are completely congested with work-in-process. There are typically about double the number of machines per square unit of floor space than there would be in an efficient layout. This is exacerbated by another condition, namely, wherever there is some vacant space because of temporary slowing down of poor operating practices, the tendency is for any small operations to settle in as "squatters" doing assembly of small components, or a welding and/or cutting operation.

3.2.3 Sub-contracting network.

In the machinery producing sectors of the advanced industrialised countries, sub-contracting has proved to be important in reducing costs. Small firms concentrating on a few operations or components common to a large number of producers are able to utilise special purpose equipment fully, as well as obtain the benefits of learning over time as a result of specialisation in a narrow area. If the volume of output were sufficient, such specialisation could occur within large firms, but quantities currently produced in most NICs and those expected to be produced in Indonesia in the near future are too small to allow this.

Two preconditions must be satisfied to reap the potential benefits of sub-contracting. First, the mother firm must be able to coordinate multiple sources of supply so that production is not interrupted by the absence of components. Second, the sub-contractors must be efficient and reliable.

The evidence from NICs suggests that sub-contracting in these countries is limited. There is, to be sure, some sub-contracting in some countries (Mexico) and in some sectors, but it is the exception, not the rule. This is the result partly of unreliability of existing sub-contractors in meeting delivery dates and quality specifications and partly of relatively high costs.

The two conditions combined imply that sub-contracting is cost effective when the organisational costs of sub-contracting are less than the cost reductions to be derived from it, i.e., from better factor utilisation and learning by doing. A further implication is that improved sectoral division of labour is contingent upon the accumulation of adequate organisational ability.

Related to the weakness of sub-contracting networks is the absence of an ability to rebuild equipment. This ability increases productivity because the cost of rebuilding typically is low relative to the price of new machines. In many cases rebuilding does not involve going back to the original design, yet it often leads to the addition of newly available features. While in developed countries numerous firms specialise in rebuilding, there is none in the Republic of Korea, the Province of Taiwan, the Philippines, etc.

3.3 Backward Linkages

Production of machinery does not operate in a vacuum. It necessitates the prior existence of well developed casting and forging activities. The production of these inputs is intensive in skilled labour, and mechanisation is not economical, except at very high volumes. Two sets of questions arise here about the performance of most NICs in this production. First, there are narrow questions about intra-plant efficiency. Second, there are broad questions arising from the high costs of domestic production and import substitution policies.

To establish the relative labour intensity of foundry and forging operations in NICs, consider the typical fixed-capital/labour ratios in India and the developed countries: in India it is $3,500 per worker, in the developed countries it is $25,000. But despite the savings in fixed capital, the price of Indian forgings similar in quality to imported forgings is, on the average, 50 per cent above the c.i.f. price of comparable imports. Half this difference is attributable to factors external to the firm such as the high price and erratic supply of raw materials. The remainder is attributable to internal inefficiency and small production runs. It has been calculated that Indian foundries and forges could, at internationally competitive prices (mainly of iron and steel) and improved and achievable levels of internal efficiency, sell their products at about 90 per cent of the world price. This could certainly contribute to the efficiency of the machinery producing sector.

Similar difficulties are encountered in the Republic of Korea and Mexico. A typical finding in the Republic of Korea is that the forging blanks weigh two to two-and-a-half pounds per pound of the net weight of the forged part. The wastage of material is twice or more that occurring with good practice. One interesting possibility noted in the study of technical development in Argentina is that faster technical upgrading may occur if supplier industries initially sell to high-quality producers of consumer durables such as automobile manufacturers.[1/]

Indonesia faces a number of structural challenges in its quest to build its non-oil sectors. Among them are the re-structuring of the manufacturing sector by developing capital goods producing activities, balancing agriculture and industry by furthering the integration of the joint dependencies, and balancing the regional mix of economic activity. Structural considerations are not separable, however, from efficiency considerations as these two aspects reinforce one another. Through efficiency resources are saved and more can be accomplished from any given volume of investment. Through efficiency, moreover, it is possible to maintain structural achievements which otherwise may not be sustainable without intolerable burdens. On the other hand, efficiency is not meaningful independent of the chosen structures within which it operates. Efficiency is desirable only in relation to effecting desirable objectives. What is not worth doing at all is not worth doing well.

Indonesia can save herself enormous waste by securing high task productivity, through proper training, specialisation and standardisation of work, and high plant-wide productivity by ensuring a clean and clear working space, by using jigs and fixtures, by proper material handling, by using proper tools, by understanding the potential of the machines, by productive layout of machines, by the development of reliable and specialised sub-contracting networks, by minimising the cost of coordinating parent and sub-contracting relationships and by the development of a competent and cost-efficient input supply network that feeds efficiently and reliably into the using sectors producing machinery.

To learn from the experience of others presupposes the existence of the will to learn and the will to apply the new knowledge and this presupposes the

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1/ Mariluz Cortes, "Argentina: Technical Development and Technology Exports to other LDC's", World Bank, February 1978.

existence of an educated core of policy-makers with a clear vision of the future and a strong sense of determination to effect change and progress. Indonesia is fortunate in having such a core, but policies adopted under pressure have not always, in retrospect, proved sound. Here again, the experience of other NICs may be useful and helpful.

3.4 Government policies

Superimposed on the technical difficulties faced by an infant capital goods producing sector may be additional difficulties induced by a policy designed to foster that sector's development. For example, in the Republic of Korea, Mexico and India there has been an early emphasis on the encouragement of large-scale firms by using a variety of incentives, including low-interest loans, investment credits and tax concessions. The outcome has frequently been the purchase of equipment that is several-fold too large for the domestic market. This is different from the problem faced by medium-sized firms which may initially possess equipment that can be efficiently used with a doubling of demand. The larger machines, we are emphasising here, may not initially be used for more than one-tenth of their capacity. Production is then saddled with inordinately high fixed costs and often leads to a diversified production base which competes with the product lines of small and medium-size firms, thereby reducing these firms production runs and raising social costs of production for the economy. Although this phenomenon is not limited to the capital goods' producing sector, it is more significant than in the capital goods using industries, given the much larger range of products that can be manufactured with a given set of equipment and the larger setting costs for each run.

The emphasis on size often leads to laxity about quality. This is particularly evident in the case of machine tools, such as cutters and shapers of metal which are used in the production of all equipment. But if locally produced tools are not adequate for the high precision needed in much of the equipment-producing sector they may compromise the effectiveness and competitiveness of the latter sector.

In such circumstances government policy must address this problem at two levels. First, emphasis on quality should be paramount and second, some imports should be admitted. The effect of restrictions on imports in India is well documented in this quotation:[1/]

> With few exceptions, machine tools and equipment are 10-25 years old and in poor condition due to both difficulty of importing spare parts and bad maintenance. This is particularly so in the heavy machine tool sectors where little if any replacement has taken place. Single purpose, non-automatic light machine tools dominate throughout, with consequently variable operator workmanship. In the early 1950s, when most Indian firms commenced manufacture, machinery was of low speed simple construction and had remained virtually unchanged for the previous 50 years. For these models, and with abundant cheap labour, the original machine tools were adequate. In the early 1960s there was a revolution in textile machinery design leading to machines 3-4 times faster than 1950 models. Within a few years this sophistication in design had out-moded all existing machine tools, as tolerance became critical, and extensive investment in re-tooling became the order of the day in Europe and Japan. Indian textile machinery makers did not follow suit and today expect to manufacture modern products with obsolete machinery. This leads to lower quality. In a large number of cases rejection rates are reportedly so high that, unless defects are overlooked and faulty parts used, production would be halted. The sad state of machinery has a disastrous cascading effect. Varying tolerance and modest operational ability necessitates intensive inspection. Usually costly remedial action has to be taken to patch up machines. Most machines have to be erected in plant and far too much filing was undertaken to ensure that all the parts fit. The lack of standardisation is also a constant concern for textile mills since it is very difficult to find spare parts that fit their machinery.

1/ The textile machinery in India (World Bank 1975) pp.20-21

3.5 Export Prospects of Machinery

Firms in the developed countries have found it increasingly difficult to produce simple standard universal machines at competitive prices and are, therefore, obliged to concentrate on the production of more sophisticated machines. This trend has opened up the possibility of developing countries penetrating international markets. In 1979, the developed market economies imported machines valued at $196 million from developing countries, a substantial increase over the $4.3 million in 1970. More promising perhaps is the trade in machinery among developing countries which has grown from $13 million in 1970 to $98 million in 1978.[1/]

There are regional characteristics that affect the pattern of machine exports from developing countries. For instance, the distance between suppliers and markets appears to be an important factor. For users in Europe, Africa and, to a less extent, West Asia, standard machines are available at relatively low costs in the neighbouring developed countries such as Spain, Yugoslavia and in Centrally Planned Economies. On the other hand, major suppliers to South and East Asian markets are India, Korea, and Singapore. Canada and the United States have easy access to Latin American suppliers in Argentina, Brazil and Mexico.

Developed countries import primarily conventional lathes, drilling machines and grinding machines demand for all of which is price-elastic. For instance, Japan's imports of machines from developing countries accounted for only 8.5 per cent of the value of her machine imports, but for about half the number of machines imported. These figures suggest that machines imported from developing countries were much cheaper than those imported from other developed countries; the average unit price per machine supplied by firms in the developing countries was $2,480 as compared to $28,530 from those obtained from suppliers in other developed countries.[2/]

The foregoing evidence is particularly relevant for the machine tool industry but carries with it significant lessons for the capital goods sector at large. Indonesia's export chances are best in conventional, standardised and cheap machinery and should be directed primarily to the Asian rim and/or Middle East and North America.

1/ UN, Statistical Office.
2/ Ministry of Finance, Customs Statistics, Tokyo, Japan.

3.6 Design adaptation and indigenous research and development

Given that the wage-rental ratio, however distorted it may be, is considerably lower in the NICs producing equipment than in the developed countries and given a cost minimisation objective, locally produced machinery should be labour-intensive. The rather thin evidence on this matter from NICs, however, suggests otherwise. But, the production of vintages of equipment no longer produced by more advanced countries shows responses to domestic factor proportions.

There are two sets of evidence on which to draw. First, there are detailed studies of specific sectors in LDCs, such as the Indian textile-machinery industry. Because these are focused on machine production, considerable information is available about the character and significance of technical design changes of the final product as well as the production of older designs, usually under licence. Much of the evidence on this matter is drawn from the experience of large firms and as such is applicable only to this class of firms.

A second set of studies describes the design activities of NICs equipment producers as a by-product of other interests, including analysis of export performance, the choice of technique, and the efficiency of small-scale enterprises.

Large firms often produce under licence and behind protected tariff walls They consequently face weak incentives to obtain the cost advantage that more labour-intensive equipment would confer. Smaller producers of equipment are more likely to sell to firms facing more competitive factor and product markets and, as a result, to undertake greater adaptation of imported designs or to produce their own. Indonesia would be well advised not to overlook this evidence. As long as large firms continue to rely on licences, only smaller firms are expected to be interested in copying and adapting existing equipment. Indians and Koreans continue to produce semi-automatic looms which have proved more desirable in the local market, partly because of only sporadic availability of the high-quality yarn necessary to realize the fast speeds of modern looms and partly because of the lower initial cost of equipment and low wages in the textile sector.

Relying solely on equipment of older vintage, may end up giving the developed countries technological dominance. Design research is then a very crucial complement to considerations of efficiency elaborated above.

There are a number of instances of companies modifying imported designs, upgrading them, and producing a machine that permits a lower capital-labour ratio in the using sector. For example, Argentine companies are currently producing food-processing equipment that is less mechanised than advanced-country equipment designed for the same product. Other pieces of evidence indicate that smaller firms in many countries, usually not manufacturing under licence, have produced simple equipment that is often used for the production of goods whose quality is too low for international trade.

There is also ample evidence that developing countries in general do not devote much effort or resources to research, and that is true even in the NICs. Much of the limited research undertaken in developing countries is process related and pertains primarily to design. Research and development in developing countries suffer from a major comparative disadvantage within the prevailing structures. Structural and institutional changes are required to elevate this activity to the level needed to match the continuous breakthroughs in the advanced economies. In simple terms, Indonesian policy-makers must approach this area by treating technology development as an infant industry that requires necessary but temporary nurturing.

3.7 Conclusions

The long-term competitiveness of Indonesia's capital goods production will ultimately depend on three conditions: first, reducing excess production costs attributable to the types of inefficiencies cited earlier; second, undertaking research to reduce production costs and to alter designs; and third, expanding the domestic market and venturing into the world market.

Some of the excess production costs attributable to inefficiencies will decline of their own accord through greater experience and a growing level of output. Labour productivity on set tasks will improve with learning by doing. Plant-wide productivity should also grow as a consequence of an increase of individual plants and management training. In addition, augmented organisational experience should increase the ability of both the firm and the sector to gain from sub-contracting.

On the other hand, X-inefficient practices -- the absence of conversion guides for machine operators, the misuse of existing machinery and problems of layout -- are likely to require special attention, foreign consultants, visits to foreign firms and upgrading of both firm level and country-wide research organisations to enhance knowledge of the best practice.

STATISTICAL ANNEX

Annex Table 1

World Exports and Imports of Engineering Products, 1978

	Exports		Imports	
	10^6 US $	%	10^6 US $	%
Developed market economy countries	324,771	88.2	220,404	59.9
of which:				
West Germany	66,847	18.2	23,895	6.5
U.S.A.	60,156	16.3	44,871	12.2
Japan	55,511	15.1	4,518	1.2
France	27,822	7.6	19,319	5.3
U.K.	24,432	6.6	17,665	4.8
Italy	18,400	5.0	10,765	2.9
Canada	14,698	4.0	19,233	5.2
Developed planned economy countries	36,410	9.3	37,492	10.1
of which:				
U.S.S.R.	9,906	2.7	17,491	4.8
Czechoslovakia	5,603	1.5	3,557	1.0
Developing countries	9,385	2.6	110,326	30.0
World Total	370,565	100.0	370,565	100.0

Source: Bulletin of Statistics on World Trade Engineering Products, 1970 ECE, United Nations, New York, 1980.

Annex Table 2

Development of Trade in Engineering Products between Economic Regions, 1970 and 1978
(Millions of Current US $)

From \ To	Development market economy countries 1970	1978	Developed planned economy countries 1970	1978	Developing countries 1970	1978	World 1970	1978
Developed market economy countries	57,617.9	211,722.9	2,376.7	12,677.2	18,419.6	100,300.6	78,414.2	324,770.7
Developed planned economy countries	800.1	3,282.5	7,202.7	24,819.6	2,065.7	5,965.6	10,072.2	34,067.7[a/]
Developing countries	504.5	5,439.0	7.6	5.6	455.6	4,030.0	967.7	9,384.6
World	58,922.5	220,404.3	9,587.0	37,492.4	20,940.9	110,326.2	89,454.1	368,222.9[a/]

Source: Bulletin of Statistics on World Trade in Engineering Products, 1978, ECE United Nations, New York, 1980.

a/ Excludes exports of Romania not distributed by destination of 2,342.3.

Machinery and Transport Equipment: Production and Trade a/ in Selected Developing Countries
(1980 or latest year available)

Country or Territory	Year	(1) Value Added	(2) Number of Empl.	(3) Gross Output	(4) Imports	(5) Exports	(6) Apparent Consumption (3-5+4)	(7) Dom. Procurement Ratio (3-5)(6)	(8) Export Ratio (5):(3)
		$ Mill.	Thousands	$ Mill.	$ Mill.	$ Mill.	$ Mill.	Per Cent	Per Cent
GROUP I									
China b/	1980	27,700 c/	13,600	51,800 c/	n.a.	n.a.	n.a.	n.a.	n.a.
Brazil	1979	7,200 c/	n.a.	16,900 c/	4,000	2,400	18,500	78	18
Yugoslavia	1979	6,802	673	19,162	5,238	2,100	22,300	77	11
Republic of Korea	1979	4,597	596	13,024	6,153	3,233	15,944	61	25
India	1977	2,308 f/	1,244 f/	8,638 f/	1,234	375	9,495	87	4
Mexico	1977	n.a. f/	100 f/	3,437 f/	2,530	248	5,719	56	7
	(1976)	(709)	(106)						
Singapore	1979	1,517	148	4,029	5,190	3,767	5,452	5	93
GROUP II									
Hong Kong	1978	1,313	231	4,041	3,590	2,590	5,093	30	63
Venezuela	1979	1,284 e/	88 e/	4,050 e/	5,477	28	9,499	42	1
Uruguay	1977	154 e/	51 e/	348 e/	197	14	531	63	4
Kenya	1978	96	31	462	691	7	1,146	40	2
	(1979)	(137)	(30)						
Colombia	1977	589 e/	80 e/	1,381 e/	763	63	2,081	63	5
Iran	1974	553 e/	66 e/	1,597 e/	2,072	33	3,636	43	2
	(1977)				(6,380)	(41)			
Argentina	1978	n.a.	70 f/	1,090 f/	1,476	510	2,056	28	47
Thailand d/	1978	n.a.	n.a.	n.a.	1,637	137	-	-	-
	(1977)	(476)							
Chile	1977	433	44	723	700	27	1,395	50	4
Peru	1977	372	n.a.	845	595	27	1,413	58	3
	(1973)	(330)	(34)						
Egypt	1976	306	93	800	1,175	11	1,964	40	1.4
Philippines	1977	240	100	1,125	1,105	53	2,177	49	5
GROUP III									
Indonesia	1978	235	92	740	2,434	71	3,103	22	10
Cuba	1976	n.a.	n.a.	665	1,327	-	1,992	33	-
	(1979)		(91)						
Nigeria	1976	154	23	582	3,896	-	4,478	13	-
Ivory Coast	1978	127	7	415	902	35	1,282	30	8
Tunisia	1978	94 g/	15 g/	337	742	31	1,048	29	9
Iraq	1975	94 g/	20 g/	201	1,724	-	1,925	10	-
Zambia	1974	75	10	179	258	-	437	41	-
Bangladesh	1978	71	n.a.	147	245	3	389	37	2
	(1977)	(65)	(24)						
Ecuador	1976	69	10	148	441	5	584	25	4
Kuwait	1977	66	n.a.	108	2,205	275	2,030	-8 i/	255
	(1976)	(45)	(4.6)						
United Arab Emirates	1978	57	4.3	111	2,364	126	2,349	-1 i/	114
Malta	1978	52	5.3	94	93	48	139	33	51
Papua New Guinea	1976	48 e/	7 e/	111 e/	138	-	249	45	-
Cyprus	1979	38	4	85	236	28	293	19	33
Costa Rica	1978	n.a.	n.a.	175	363	30	508	29	17
	(1975)	(29)	(7)						
Nicaragua	1976	29 e/h/	2.4 e/h/	60 e/h/	236	2.8	294	20	5
Jordan	1978	28 h/	4.2 h/	81 h/	451	40	492	8	49
Dominican Republic	1978	29 h/	3	72	204	14	262	26	19
United Republic of Tanzania d/	1974	n.a.	n.a.	55	179	-	234	24	-
	(1977)	(27)	(7)						
Panama	1977	19	1.8	39	166	4	201	17	10
Madagascar	1976	9.6 h/	3	30.7 h/	70.5	2.1	99	29	7
Mauritius	1976	9.1 h/	n.a.	21.3 h/	86.7	10.9	97	11	51
Fiji	1977	9.0	1.4	24.9	54.6	5.1	74.4	27	20
Barbados	1977	6	2	16	51	11	56	9	69
Ethiopia	1976	3.1	1.1	8.4	120	3.4	125	4	40
Afghanistan	1977	n.a.	2	5.4	35	-	40.4	13	-
Somalia	1976	0.2	0.1	0.9	44	1.6	43	-2 i/	186

Source: United Nations, Yearbook of International Trade Statistics, 1979 (United Nations publication, Sales No. E/F.80.XVII.5) vol.I., United Nations Yearbook of Industrial Statistics, 1978 Edition (United Nations publication, Sales No. E.80.XVII.9) and Ibid: 1979 Edition (United Nations publication, Sales No. E.81.XVII.8).

a/ Value added, gross output and employment refer to ISIC 38; imports and exports refer to SITC 7 (Rev.1).
b/ See table I.3 for the method used in Chinese statistics.
c/ Capital goods only (see table I.3 for explanation of data).
d/ For the United Republic of Tanzania and Thailand see table I.3.
e/ Including ISIC 390.
f/ Excluding ISIC 385.
g/ Including ISIC 372.
h/ Including ISIC 371 and 372.
i/ The ratio is negative owing to imports that are re-exported.

Annex Table 4

Indicators of the Development of the Capital Goods Sector in Selected Developing Countries
(1980 or latest available year)

	China, Peoples Rep. of	India	Brazil	Rep. of Korea	Peru	Thailand	United Rep. of Tanzania
1. Number of establishment[a/] engaged in capital goods manufacturing (thousands)	107.2	17.9	11.2	6.0	1.5	1	0.1
2. Number of workers engaged[b/] in capital goods manufacturing (thousands)	13,600	1,230	838	417	51	n.a.	7
3. Number of scientists and[c/] engineers	n.a.	698	541	800	85	20	n.a.
4. Number of engineering[d/] graduates	n.a.	13,611	8,140	32,193	346	2,131	53
(per cent increase over 10 years earlier)	n.a.	14	148	539	31	470	n.a.
5. Gross output[e/] ($billion)	51.8	8.5	16.9	9.2	0.8	n.a.	n.a.
6. Imports[f/] ($billion)	n.a.	1.2	4.0	6.1	0.6	1.6	0.4
7. Exports[g/] ($billion)	n.a.	0.4	2.4	2.4	0.03	0.1	n.a.
8. (7) : (5) (per cent)	n.a.	4.7	14.2	26.5	3.0	n.a.	n.a.
9. (7) as per cent of all manufactured exports (SITC 5 to 8-(67 + 68)	n.a.	15.0	29.0	19.0	25.0	16.2	n.a.
10. Apparent consumption of capital goods ($billion) ((5)+(6)-(7))	n.a.	9.3	18.5	12.9	1.4.	n.a.	n.a.
11. Domestic supply ratio ((5)-(7) as per cent of (10))	n.a.	87.1	78.4	52.0	58.0	n.a.	n.a.
12. Value added[h/] ($billion)	15.5	2.2	7.2	3.3	0.4	0.77	0.027
13. Production of machine tools[i/] ($million)	420	156	380	130	n.a.	n.a.	n.a.
14. of which exports	28	27	46	25	n.a.	n.a.	n.a.
15. Imports of machine tools[j/] ($million)	60	48	8.9	360	64	95	18
16. Apparent consumption[k/] of machine tools ($million) ((13)+(15)-(14))	452	177	423	465	n.a.	n.a.	n.a.
17. Domestic supply ratio for machine tools ((13)-(14) as per cent of (16)	86	73	79	23	n.a.	n.a.	n.a.

Note: The data are not strictly comparable owing to differences in coverage of years, number of establishments and goods produced and traded. The information for India and the Republic of Korea in this table differs from that shown elsewhere because consumer goods are excluded from production and trade data. For details see following notes and sources.

Notes and sources

a/ Brazil, Republic of Korea, Peru: establishments employing five or more workers; India: Establishments with 10 or more workers using electric power, or 20 or more workers not using power; China: all establishments (wholly people-owned and collectively-owned enterprises); Thailand: small shops with fewer than 10 employees are included in the estimate provided in a case study of Thailand (TD/B/C.6/AC.7/4 of UNCTAD); United Republic of Tanzania: estimate from a case study (TD.B/C.6/AC.7/5 of UNCTAD).

The information relates to 1980 (China), 1979 (Republic of Korea), 1977 (India, United Republic of Tanzania and Peru), 1974 (Brazil). Sources: United Nations Yearbook of Industrial Statistics, 1978 edition and 1979 edition, vol. 1 for Brazil, the country case studies for the other countries and Report on Mining and Manufacturing 1979. Economic Planning Board, Republic of Korea, 1981. Establishments making radio and TV sets (ISIC 3832) were excluded in India and Republic of Korea but not in the other countries.

b/ Same coverage as for a/. With respect to China, in the United Nations Yearbook of Industrial Statistics, 1979 edition, vol. 1, p.86, it is reported that the total number of employees in ISIC 382- the only subsector reported under ISIC 38- was 9,175,000 and includes only employees of wholly-owned enterprises with independent accounts. In the case of the United Republic of Tanzania the figure is an estimate based on the 1974 figure given in a UNCTAD case study of 5,300 and an estimated growth rate of 14 per cent per annum extended to 1977.

c/ The number of scientists and engineers in taken from Statistical Yearbook of UNESCO, 1981. Data are given for following years: 1977 (India and Republic of Korea), 1975 (Thailand), 1974 (Peru), 1970 (Brazil).

d/ The information relates to 1979 for the Republic of Korea, 1978 for Brazil, 1977 for Peru, and 1976 for India, United Republic of Tanzania. Source: Statistical Yearbook of UNESCO, 1972, 1975 and 1981 editions.

e/ Excluding electrical appliances and passenger cars in Brazil, India and Republic of Korea; ISIC 38 for Peru. For China, gross output is expressed in 1970 prices converted into US dollars at the 1970 rate of exchange.

The information relates to 1980 for China, 1979 for the Republic of Korea and Brazil, and 1977 for Peru and India.

f/ Imports are SITC 7, Rev. 1 for India, Peru, Thailand and United Republic of Tanzania, SITC 7 minus 781 (following SITC, Rev. 2) for the Republic of Korea. For Brazil data concerning capital goods imports were taken from the Brazilian case study (TD/B/C.7/AC.7/6). The informaion relates to 1980 for the United Republic of Tanzania, 1979 for Brazil and Repulic of Korea, 1979 for Thailand and 1977 for India and Peru.

g/ Exports are SITC 7, Rev. 1 for India, Peru and Thailand, SITC 7 minus (761+762+763+781), following SITC, Rev. 2 for the Republic of Korea. For Brazil, they were taken from the case study. The information relates to the same year as for imports (see note (b) above).

h/ Value added for India, Brazil and Republic of Korea refer to the same coverage as gross output; for China, value added was estimated to be 30 per cent of gross output. For Brazil, value added has been estimated on the basis of the share of value added in gross output of ISIC 382 to 385 and 390 in 1974 (as reported in the United Nations Yearbook of Industrial Statistics), applying it to the 1979 figure (reported in the Brazilian case study). For Thailand, the information was taken from the Thailand case study. For the United Republic of Tanzania, the figure was obtained by applying the ratio of ISIC 38 to GDP in 1974 to the GDP estimates for 1977, assuming that this ratio stays more or less constant. The information relates to 1980 for China, 1979 for Brazil, Thailand and Republic of Korea, and 1977 for India, United Republic of Tanzania and Peru.

i/ Estimates for 1980 as shown in National Machine Tool Builders' Association (McLean, Virginia, USA), Economic Handbook of the Machine Tool Industry 1981-1982, United States, 1981, page 165.

j/ 1980 for China, India, Republic of Korea and Brazil, as shown in National Machine Tool Builders' Association, "Economic Handbook ..." (op. cit.) page 165. For Peru, Thailand and United Republic of Tanzania the figures represent the accumulated imports in the period 1972-1977 (SITC 715.1 Rev.1). Imports of machine tools into Peru and Thailand in 1977 were only US $9 million and $24 million respectively; into the United Republic of Tanzania they were $14 million in 1975 and $2 million in 1976.

k/ Since in Peru, Thailand and the United Republic of Tanzania local production is very small or non-existent, the accumulated imports in the 1972-1977 period can give a rough idea of the recent stock. For the other countries the figures for apparent consumption relate to 1980.

Annex Table 5

Manufacturing value added (MVA) of ISIC-groups 382, 383 and 384
(machinery and transport equipment) 1970, 1975 and 1980
(in 1000 US $, at constant 1975 prices)

	1970	1975	1981	
Bangladesh	......	10,600	32,186	
India	1,844,181	2,187,300	3,149,934	
Indonesia	64,203	159,300	335,938	
Hong Kong	292,420	423,900	569,523	(1976)
Korea, Republic of	115,324	519,203	1,593,632	(1980)
Malaysia (Western part only)	119,274	190,100	335,947	(1980)
Pakistan	75,637	140,600	138,994	(1976)
Philippines	232,743	302,000	464,321	
Singapore	188,491	426,000	1,385,528	
Sri Lanka	27,078	28,700	....	
Thailand	88,384	196,900	....	

Source: UNIDO: Industrial Strategies and Policies in Developing South, Southeast and East Asia: A Review.UNIDO/IS.412, 15 November 1983.

Annex Table 6

Growth of Industrial Production in 15 Latin American Countries, 1960-80
(Average compound rates of growth)

	GDP %	Industry[a/] %
Argentina	3.3	4.0
Bolivia	5.0	5.8
Brazil	7.4	7.8
Columbia	5.6	5.4
Costa Rica	5.8	8.0
Chile	3.7	3.5
Ecuador	6.4	9.0
El Salvador	4.4	5.4
Guatemala	5.5	7.1
Honduras	4.5	5.6
Mexico	5.8	7.8
Nicaragua	4.1	6.0
Paraguay	6.5	8.7
Peru	4.0	4.4
Venezuela	5.2	6.3
Unweighted average	5.1	6.3

Source: ECLA, based upon Official Statistics.

a/ Includes mining and construction.

Annex Table 7

Latin America (15 countries)[a]: Structure of the Manufacturing Industries, 1950-1977
(Percentages of Value Added)

ISIC	Industry	1950[b]	1955[b]	1960[c]	1965	1970	1975	1976[d]	1977[d/e]
311-312 313-314	Food, beverage and Tobacco	31.0	28.6	26.7	24.4	23.0	20.7	19.8	18.9
321	Textiles	15.9	14.7	11.9	10.2	8.8	8.2	7.9	7.8
322-324	Wearing apparel and footwear	8.1	7.1	5.5	4.5	3.6	3.5	3.2	3.0
323	Leather	1.0	0.9	0.7	0.6	0.8	0.4	0.4	0.3
332	Furniture	2.2	1.9	1.7	1.5	1.3	1.3	1.3	1.5
342	Printing and publishing	4.2	4.0	3.5	3.3	3.2	2.6	2.7	2.8
390	Other manufactures	1.0	0.9	0.9	0.9	1.1	0.9	0.9	0.9
	Subtotal Group A	63.4	58.1	50.9	45.5	41.8	37.6	36.2	35.1
331	Wood and cork products	2.9	2.4	2.3	2.1	1.8	1.7	1.8	2.1
341	Paper and paper products	2.2	2.4	2.1	2.5	2.6	2.3	2.4	2.4
351-352 356	Industrial chemicals, other chemicals and plastic products	5.4	7.3	8.8	10.0	11.3	12.6	13.5	14.7
353-354	Petroleum refineries and misc. products of petroleum and coal	4.8	5.6	6.0	6.6	6.3	5.6	5.8	4.3
355	Rubber products	1.5	1.8	1.8	1.9	2.0	2.2	2.3	2.3
361-362 369	Manufacture of non-metallic mineral products	5.3	5.6	4.9	4.6	5.1	5.4	5.4	6.1
371-372	Iron and steel and non-ferrous metals	3.6	4.6	5.7	7.0	7.3	7.6	7.4	8.5
	Subtotal Group B	25.7	29.7	31.7	34.6	36.4	37.4	38.6	40.4
381	Metal products	4.3	4.6	4.6	5.6	5.8	5.6	5.4	5.0
382	Non-electrical machinery	2.9	3.5	4.2	4.4	4.5	5.4	5.8	5.1
383	Electrical machinery	0.9	1.1	3.0	3.8	4.3	4.7	5.0	5.7
384	Transport equipment	2.4	2.6	5.1	5.5	6.7	8.7	8.3	7.9
385	Professional equipment	0.4	0.4	0.5	0.6	0.4	0.6	0.6	0.8
	Subtotal Group C	10.9	12.2	17.4	19.9	21.8	25.0	25.3	24.5
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: ECLA, based on official statistics.

a/ Argentina, Bolivia, Brazil, Colombia, Costa Rica, Chile, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru and Venezuela.

b/ Excluding Bolivia, Chile, Paraguay and member countries of the Central American Common Market (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua).

c/ Excluding Paraguay.

d/ Excluding member countries of the Central American Common Market.

e/ Excluding Argentina.

Share of Metal Working Industry in the Manufacturing Industry in Latin America and Selected Sub-regions 1950-1977
(Percentages of Value Added)

ISIC	Product Group	1950	1955	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977
Latin America													
381	Fabricated metal products	4.3	4.6	4.6	5.6	5.8	5.7	5.8	5.7	5.4	5.6	5.4	5.0
382	Non-electrical machinery	2.9	3.5	4.2	4.4	4.5	5.0	5.4	5.9	5.6	5.4	5.8	5.1
383	Electrical machinery	0.9	1.1	3.0	3.8	4.3	4.4	4.6	4.9	4.5	4.7	5.0	5.7
384	Transport machinery	2.4	2.6	5.1	5.5	6.7	7.2	7.5	8.2	8.9	8.7	8.3	7.9
385	Professional equipment	0.4	0.4	0.5	0.6	0.4	0.6	0.7	0.7	0.6	0.6	0.6	0.8
	Subtotal	10.9	12.2	17.4	19.9	21.8	23.0	24.0	25.4	25.0	25.0	25.2	24.5
Brazil													
381	Fabricated metal products	-	2.9	3.4	3.9	4.3	4.7	5.0	5.4	5.2	5.2	5.2	5.0
382	Machinery except electrical		5.5	6.4	6.8	7.0	7.6	8.1	8.8	8.4	7.4	7.5	6.9
383	Electrical machinery	10.9	1.2	3.2	4.3	5.3	5.7	6.0	6.5	5.4	5.6	5.9	5.9
384	Transport equipment		1.2	5.2	5.1	8.0	8.9	9.6	10.3	11.7	11.5	10.9	10.4
385	Professional equipment		0.2	0.4	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	Subtotal Group C	10.9	11.1	18.6	20.6	25.2	27.6	29.4	31.7	31.3	30.5	30.2	28.9
Andean Group a/													
381	Fabricated metal products	1.2	1.6	2.8	3.5	3.7	3.8	3.8	3.8	3.6	4.4	4.1	4.8
382	Machinery except electrical	0.8	0.9	1.3	1.9	1.8	1.9	2.2	2.2	2.1	2.6	2.7	3.6
383	Electrical machinery	1.0	1.0	1.3	2.1	2.6	2.7	2.9	2.9	3.0	3.7	3.7	4.1
384	Transport equipment	1.4	2.0	2.0	3.3	3.0	3.1	3.3	3.5	3.2	3.9	3.6	2.8
385	Professional equipment		0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.2	0.3
	Subtotal	4.4	5.6	7.5	10.9	11.3	11.7	12.4	12.6	12.2	15.0	14.3	15.7
Central America b/													
381	Fabricated metal products			1.2	3.1	4.8	4.8	4.9	5.0	5.0	4.6		
382	Non-electrical machinery			0.7	1.1	1.2	1.3	1.2	1.2	1.2	1.1		
383	Electrical machinery			0.3	0.7	1.7	1.7	1.7	1.8	1.9	1.8		
384	Transport equipment			1.8	1.5	1.6	1.7	1.6	1.5	1.6	1.7		
	Subtotal			4.0	6.3	9.3	9.5	9.4	9.5	9.7	9.2		

Source: UNIDO: The Capital Goods Industry in Latin America: present situation and prospects (draft dated 15 November 1983 UNIDO/IS)

a/ Bolivia, Colombia, Ecuador, Peru and Venezuela.
b/ Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

Annex Table 9

Transnational Enterprises in the Capital Goods Sector in Brazil, 1977

	Transnational enterprises		Transnational investment		Major transnational enterprises		Investment per enterprise Million of US $
	Number	% of Total	Million of US $	%	Number	Share in sales of all TNG of same product group (%)	
Mechanical industry	106	16.4	825	8.1	10	48.1	7.8
Electrical equipment and telecommunications	71	11.0	1,639	16.0	10	59.6	23.1
Transport equipment	46	7.1	1,726	16.9	10	82.1	35.5
Total of above	223	34.5	4,190	41.0	30	63.3	18.8
Total of transnational enterprises in manufacturing industries	647	100.0	10,217	100.0	105	62.5	15.8

Source: UNIDO: The Capital Goods Industry in Latin America: present situation and prospects (draft dated 15 November 1983 UNIDO/IS).

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