

**THE STUDY FOR UPGRADING
THE MEASUREMENTS CENTRE,
STANDARDS AND INDUSTRIAL RESEARCH
INSTITUTE OF MALAYSIA
FINAL REPORT**

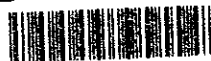
JANUARY, 1994

JAPAN QUALITY ASSURANCE ORGANIZATION

JAPAN INTERNATIONAL COOPERATION AGENCY
MALAYSIA ECONOMIC PLANNING UNIT,
PRIME MINISTER'S DEPARTMENT

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PREFACE

In response to a request from the Government of Malaysia, the Government of Japan decided to conduct a study for Upgrading the Measurements Centre, SIRIM of Malaysia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Malaysia a study team headed by Mr. Kiyoto Mitsui, Japan Quality Assurance Organization, from June to July 1993.

The team held discussions with the officials concerned of the Government of Malaysia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Malaysia for their close cooperation extended to the team.

January, 1994

Kensuke Yanagiya
President

Japan International Cooperation Agency

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CHAPTER 1

BACKGROUND AND OBJECTIVE OF THE STUDY

1. BACKGROUND AND OBJECTIVE OF THE STUDY

1.1 Background of the Study

Project-type technical cooperation (National Metrology Laboratory Project) was provided for 4 years from December, 1981 to January, 1986 for the SIRIM Measurement Centre of the Standards and Industrial Research Institute of Malaysia (SIRIM), greatly contributing to the establishment of measurement standards, improvement of measuring technologies/techniques and provision of calibration services in Malaysia. Seven years after the completion of the said cooperation, the capacity and capability of the SIRIM Measurement Centre have begun to fall short of the more advanced and diverse requirements of Malaysian industries, leading to a strong call for the expansion and strengthening of its functions. Functional consolidation of the SIRIM Measurement Centre is also called for by the "Study to Plan the Promotion of Industrial Standardisation and Quality Control" implemented during the period between January, 1992 and January, 1993 to improve the international competitiveness of Malaysian industrial products.

Against this background, the Japan International Cooperation Agency (JICA) sent the Project Feasibility Study Team to Malaysia in February, 1993 in response to a request made by the Malaysian side to assist the development study on the proposed upgrading of the SIRIM Measurement Centre and to discuss the contents of the request and other issues with related organizations in Malaysia.

As a result of the discussions, the SIRIM requested JICA to prepare a master plan for the fundamental upgrading of the existing functions of the SIRIM Measurement Centre to strengthen the base for industrial development and to further support the increasingly advanced nature of industrial activities in Malaysia.

In response to this request, JICA sent the Preliminary Study Team to Malaysia in March, 1993 which subsequently confirmed the background and contents of the request. Following a series of consultations to facilitate the implementation of a full-scale study, the Scope of Work (S/W) for the implementation of the Study for Upgrading of the SIRIM Measurement Centre, Standards and Industrial Research Institute of Malaysia (the Study) was signed by the JICA Team and the Economic Planning Unit (EPU) of the Prime Minister's Department.

1.2 Objective of the Study

The objective of the Study is the preparation of a master plan for the upgrading of the SIRIM Measurement Centre to ensure the efficient management of the national metrology system in Malaysia. The intended master plan will place special emphasis on the following items, taking the present conditions of the national standards and industrial metrology system and also the current industrial requirements in Malaysia into consideration.

- (1) Establishment, renewal and maintenance of national standards
- (2) Establishment and enforcement of national traceability system
- (3) Research and development of measurement technologies/techniques
- (4) Promotion of wider use of traceability technologies to industries
- (5) Provision of calibration service

1.3 Scope of the Study

The scope of the Study is described below as determined in the S/W.

- (1) Study on Background
 - (a) Current industrial situation
 - (b) National industrial development policies
 - (c) Legal metrology system
 - (d) General conditions relating to national standards, legal metrology system, industrial measurement system, traceability system and calibration service
- (2) Current State of Metrology and Future Plan
 - (a) Policies, laws, regulations and management system relating to metrology system
 - (b) Metrology management system
 - (c) Calibration organizations and their activities
 - (d) Suitability of traceability system

- (e) Measurement facilities and technical staffs
- (f) Education and training of technical staffs
- (3) Preparation of Development Plan for Measurement System
 - (a) Upgrading and expansion of national standards
 - (b) Enforcement of industrial measurement system
 - (c) Restructuring of traceability system
 - (d) Expansion of calibration service
- (4) Preparation of SIRIM SIRIM Measurement Centre Upgrading Project
 - (a) Functions and activities
 - (b) Management
 - (c) Staff recruitment
 - (d) Equipment
 - (e) Facilities, floor area and layout
 - (f) Cost estimate
 - (g) Necessary measures for training of technical staffs
 - (h) Implementation plan

CHAPTER 2

PRESENT STATUS AND FUTURE OUTLOOK OF INDUSTRIAL DEVELOPMENT IN MALAYSIA

2. PRESENT STATUS AND FUTURE OUTLOOK OF INDUSTRIAL DEVELOPMENT IN MALAYSIA

2.1 Overview of Economy

2.1.1 General

Malaysia comprises Peninsular Malaysia situated at the edge of continental Southeast Asia and the states of Sabah, Sarawak and the Federal Territory of Labuan in the north-western coastal part of Borneo Island, covering an area of about 329,758 square kilometers in total. These two regions are separated by about 540 kilometers of the South China Sea. Peninsular Malaysia covering 131,598 square kilometers borders on Thailand in the north and Singapore in the south. Sabah and Sarawak, with areas of 73,620 and 124,449 square kilometers respectively, have frontiers with Kalimantan, Indonesia. The Federal Territory of Labuan is situated off the west coast of Sabah, and has an area of 91 square kilometers. About four-fifths of Malaysia, including Sabah and Sarawak, are covered by tropical rain forest (See the map on the first page).

Malaysia, as a federal nation, consists of 13 states, namely 11 Peninsular states, Sabah and Sarawak, and 2 Federal Territories (Kuala Lumpur and Labuan Island). As economic zones, Malaysia is usually split into three areas, namely Peninsular, Sabah and Sarawak following their geographical features. The names of respective states and the Federal Territories, area and population are shown in Table 2-1.

Peninsular Malaysia consists of the central mountainous area, the east and the west coastal plain areas and another plain area at the south tip of the peninsula. Most of the rubber and oil palm estates, which are the main agricultural export products of Malaysia, are located on the west and south coasts. The mining of tin, another traditional export item, is done mostly in two states of Perak and Selangor in the western area.

The coastline of Peninsular Malaysia stretches 730 kilometers north and south and 320 kilometers east and west totaling 2,000 kilometers. The east coast, facing the South China Sea, is less developed because of lack of good harbors while the west coast enjoys lively economic activities much of which is through ports as traffic centers located at the river mouths. Since the mid-1970s, oil and natural gas have

been developed intensively off the east coast. However, economic activities in the area have not been sufficiently promoted as yet although relevant industries and port facilities have been developed.

In Sabah and Sarawak, the land is mostly mountainous. Small plains exist in limited coastal and river basin areas. In these plains, traffic is usually hampered by dense tropical primeval forests and swamp forests on soft alluvial ground. Owing to such natural conditions, economic activities in these states are limited to within each local area. Since the 1970s, development of oil and natural gas in offshore fields as well as related industries have made progress as the principal industry in these areas where timber had been a traditional product. Besides, pepper in Sarawak and cocoa in Sabah are known as major agricultural products.

The population of Malaysia is 17.8 million as of mid-1990. The population of 14.6 million, 82.3% of the total population, live in Peninsular Malaysia. Sabah has 1.5 million inhabitants and Sarawak has 1.7 million. Malaysia, as a multi-racial nation, comprises the Malays and the aborigines 62%, Chinese 30% and Indians 8%. The average population growth rate was 2.6% in the last decade.

2.1.2 Economic growth and changes in economic structure

The economy of Malaysia has sustained stable growth for the last two decades. Major economic indicators of Malaysia and its neighboring countries are shown in Table 2-2. Though Malaysia has a relatively small population, industrialization of the nation is well advanced and the Gross National Product (GNP) level is also in a moderate range.

Malaysia's average growth rate of the Gross Domestic Product (GDP) in real terms in the 1970s was 6.6% per annum in 1970-75 and 8.6% in 1975-80. In the 1980s, the growth rate in real terms declined to 5.1% per annum in 1980-85, under the influence of the recession of 1985-86. However, owing to rapid recovery of the economy, the annual growth rate was sustained at the level of 6.8% in 1985-90.

GDP by industrial origins in 1980-91 and the gross national expenditure 1) in the same period (both in 1978 constant price) are shown in Tables 2-3 and 2-4 respectively. Recent growth of the GDP shows a higher rate than in the past, namely, 8.7% in 1989, 9.8% in 1990 and 8.6% in 1991, respectively, in comparison with the previous years. Along with growth of the GDP, growth of the gross national

expenditure is also remarkable. The annual rate in 1980-95 was 5.0%, corresponding to the rate of the GDP, but in 1985-90 it rose to 10.2%, higher than that of the

GDP. In particular, the growth in recent years has been conspicuous: 16.1% in 1989, 16.8% in 1990 and 14.6% in 1991. Thus, the economy of Malaysia has substantially expanded and the gross national expenditure (in 197~ constant price) has risen from M\$68.4 billion in 1980 to M\$162 billion in 1991 which is 2.4 times as high as 1980.

The greatest factor behind the drastic expansion of the Malaysian economy is the growth of exports. The Government has promoted economic growth by encouraging industrialization of export-oriented business as a basic strategy, in view of limits of domestic-market-oriented industrialization due to the limited scale of the domestic market based on the small population. As Table 2-4 shows, exports reached the comparatively high ratio of 33% in the gross national expenditure as early as 1980. Then, exports sustained substantial growth, far higher than that of the GDP, resulting in the annual average of 7.1% in 1980-85 and 14.9% in 1985-1990. In particular, growth in the past three years has been remarkable: 18.1% in 1989, 18.3% in 1990 and 16.2% in 1991 which are almost two times higher than the growth rate of the GDP. Consequently, the ratio of exports in the gross national expenditure rose year by year and reached 45.8% in 1991. Meanwhile, the growth rate of the domestic expenditure 2) also rose from 4.2% as an annual average in 1980-85 to 6.6% in 1985-90; these rates are lower than those of the GDP. As a result of these conditions, growth of gross fixed capital formation was also conspicuous and its ratio in the domestic expenditure rose from 30.2% in 1980 to 34.5% in 1991. Especially important is that gross fixed capital formation in the private sector significantly grew with 30.5% in 1989, 24.8% in 1990 and 19.5% in 1990.

As the past trend indicates, the sound growth of the Malaysian economy has been sustained by drastic expansion of exports. Moreover, recent increases in local construction demand stemming from growth of private investment also contributes much to the economy. These tendencies suggest that the expansion of exports and domestic investment will be essential key factors for Malaysia to sustain the sound growth of economy.

Analysis of the composition of the GDP shows that both the agriculture sector (including forestry and fisheries) and the mining sector (excluding oil and natural gas) continued modest growth while the manufacturing sector grew rapidly, particularly in recent years. Since the mid-1970s, the development of oil and natural

gas has advanced so that it has become the core industry in the mining sector in place of tin production, a traditional mining industry. The average annual rate of growth in 1985-90 shows a very high figure of 13.6% in manufacturing industry compared to only 4.6% in the agriculture sector and 4.3% in the mining sector even including oil and natural gas. Growth of the manufacturing industry, particularly in the past two years, has been further advanced, with 17.9% in 1990 and 15.5% in 1991. This pulled up the ratio of the sector in the GDP from 19.6% in 1980 to 28.7% in 1991 while that ratio of agriculture as well as the mining sector (including oil and natural gas) declined respectively from 22.9% and 10.1% in 1980 to 17.3% and 9.3% in 1991.

As such, industrialization in Malaysia has developed rapidly in the 1980s and manufacturing industry is thus the leading force for economic growth of the country. For further development of the economy, expansion of manufacturing industry, in particular export-oriented industry, is indispensable.

Meanwhile, a relatively high ratio of imports and years of steady increases are notable observations derived from analysis of the composition of the corresponding gross supply 3) to the gross national expenditure. Especially, the increase of imports since 1985 has been sharp. The average annual increase rate in the five year period of 1985-90 is 15.7%, as much as 2.3 times greater than the GDP growth rate. Tendency for a further increases is seen in the most recent three years, namely 29.1% in 1989, 27.0% in 1990 and 22.2% in 1991. Consequently, the import ratio in the gross supply rose from 34.9% in 1980 to 47.0% in 1991. This trend indicates that the Malaysian economy is still greatly dependent on imports despite smooth growth.

The Malaysian manufacturing sector has been dependent mostly on import for its parts and raw materials supply, and the import tends to increase accordingly with the expansion of manufacturing, as to be examined in the latter part of this report. The diversification and deepening of material production basis, therefore, is one of the important the tasks to be tackled by the manufacturing sector.

Notes *1) Gross national expenditure: total of the consumption expenditure, gross fixed capital formation, increase in stock and exports of goods and non-factor services indicated in the national accounts.

*2) Domestic expenditure: total of the consumption expenditure and gross fixed capital formation indicated in the national accounts.

- *3) Gross supply: total of the gross domestic product and imports of goods and non-factor services indicated in the national accounts (the gross supply corresponds to the gross national expenditure).

2.1.3 Structure of external trade

The external trade of Malaysia for the period of 1980-90 is shown in Table 2-5. As reviewed in the above, exports played an important role in the economy, sustaining smooth growth in the past decade except for the 1986 recession. The growth rate of exports rose sharply in 1985-90 at an annual average of 15.9% for five years while the rate in 1980-85 was 6.2% per annum for the same length of period. In the meantime, the value of exports rose from M\$28.2 billion in 1980 to M\$38.0 billion in 1985 and further to M\$79.6 billion in 1990 which was almost 2.8 times as much as the amount in 1980. In particular, the growth after 1987 was so drastic that it registered 28.0% in 1987, 22.2% in 1988, 22.7% in 1989 and 17.4% in 1990. On the other hand, the imports which came to M\$23.5 billion in 1980 increased to M\$30.4 billion in 1985 with increases at an annual average rate of 5.4%. In 1986, imports as well as exports declined due to the recession. However, imports returned to a growth path in accordance with recovery of the economy. The rate of increase was 35.6% in 1988, 40.6% in 1989 and 30% in 1990. Imports in 1991 were M\$79.1 billion which was about 3.4 times as much as the amount in 1980. Although the external trade has always been shown an excess of exports, the trade surplus has been reduced year by year owing to increases of imports. If this trend lasts longer, it is likely that the external trade balance may show a deficit in the near future.

The exports of major commodities in Malaysia are shown in Table 2-6. The structure of the export industry has greatly changed in the past decade. Primary products such as rubber, oil palm, tin and timber are the traditional export items. Since the 1980s, however, exports of these primary products stagnated or declined. After the 1970s, the export of oil, and in the mid-1980s, the export of natural gas as LNG, have started. Although these two items now form the principal export industry, current growth is not conspicuous. The Government has made efforts to promote the export-oriented industrialization since the mid-1970s. Exports of manufactured products grew at an annual average rate of 14.6% in 1980-85, and their share in total exports expanded from 22.4% in 1980 to 32.8% in 1985. After 1985, it rose further to 30.5% per annum on average and registered a 59.2% share in total exports in 1990. Thus, the manufactured products are the main export items in Malaysia recently, followed by oil and LNG with the share of 16.2%, timber 8.9%,

oil palm 5.5%, rubber 3.8% and tin, which registered 8.9% of total exports in 1980, counts merely 1.1% now.

Among manufactured exports, the largest items are electrical and electronics products, and textiles and garments. Out of these two groups, the former dominated 56.5% of all exports of the manufactured products while the latter was 8.7% on average in the three years of 1988-90. Shares of the other products were: food processing and chemicals 4.7% respectively, metal 3.9%, transport equipment 3.5%, wood-based 3.3% and rubber-based 3.1%.

Exports to selected destination countries are shown in Table 2-7. The principal export markets for Malaysia are Singapore, the U.S.A., Japan and the EC. These countries are also major export markets for the manufactured exports. The share of these areas in total exports was 70.4% in 1990 (Singapore 22.8%, the U.S.A. 16.9%, Japan 15.8% and the EC 14.9%). Also in case of manufactured exports, 77.7% were exported to these areas (Singapore 27.3%, the U.S.A. 24.9%, the EC 17.4% and Japan 8.1%).

Changes in the import structure of Malaysia in the past twenty years is shown in Table 2-8. Since the mid-1960s, imports of foods and general consumer goods have gradually declined along with progress of domestic production through diversification of agriculture and the development of import substitution industries. The share of these commodities in total imports fell from 14% in 1980 to 13% in 1990. In the 1970s, imports of consumer durables sharply increased at an average rate of 24.6% per annum against the background of growth and change of demand supported by improvement of the income levels. The share of consumer durables was 2% of total imports in the 1970s, and rose to 4% in 1980. However, along with the progress of domestic production in the 1980s, imports of consumer durables decreased by 11.6% at an annual average and in 1990 the share fell to 3% of total imports.

Meanwhile, imports of raw materials and intermediates exhibit tendency to increase in proportion to the increase of imports of capital goods for factory construction and progress of industrialization. As assembly industries such as electric and electronic equipment, automobiles and other precision machinery have developed rapidly in recent years, imports of parts, components and intermediates required for those industries substantially increased, because domestic production for those items are not yet well established. The annual rate of increase of capital goods imports was 20.3% on average in the decade of 1970-80 and 15.6% in 1980-90. Shares in total

imports increased from 25% in 1970 to 30% in 1980 and further to 38% in 1990. Likewise, imports of raw materials and intermediates expanded at the annual average rate of 22.9% in the decade of 1970-80 and the share in total imports rose from 35% in 1970 to 50% in 1980. However, growth in 1980-90 declined to the annual average 11.8% and the ratio of these items in total imports fell to 45% in 1990. It was mainly due to a drastic retrenchment of crude oil imports caused by progress of oil development and a diminution of imports of agricultural inputs, such as fertilizers and pesticides, the being a result of a shift to domestic production. On the other hand, imports of raw materials and component parts for manufacturing industries increased greatly year by year. Growth averaged 22.2% in 1970-80 and 15.5% in 1980-90 and the share in total imports rose from 21% in 1970 to 28% in 1980 and further to 36% in 1990. This trend reflects the present state of Malaysia's industrialization in which domestic production of component parts and intermediates still lags due to overemphasis on assembly industries for manufacturing of finished products.

2.1.4 State of labor force and employment

Smooth economic development over a period of two decades, and in particular, rapid expansion of manufacturing industries has contributed to the creation of employment in Malaysia. The trend of the labor force and employment in 1980-90 is shown in the Table 2-9. During that period, the labor force increased at the rate of 3.2% per annum. Meanwhile, employment expanded in keeping with smooth economic growth since the 1970s and in 1980 the unemployment rate fell to the level of merely 5.6%. It worsened in 1985-86 due to the recession. After that, along with recovery of the economy, employment rose and the unemployment rate fell to 6.0% in 1990 through yearly improvement after it had peaked at 8.2% in 1987.

Thus, employment in Malaysia has stayed at a high level in recent years. However, considerable changes are seen in specific industrial sectors. The trend of employment disaggregated by sector is shown in Table 2-10. In 1980, the agriculture sector (including forestry and fishing) accounted for a 37.2% share of the total employed population, while 15.5% was in manufacturing, 5.6% in construction, and 1.3% in mining and quarrying. Shares of the tertiary industry sector and the Government service sector were 21.7% and 13.3% respectively. Since 1980 employment in agriculture had maintained a 0.7% growth on average till 1988, and since then has shown a gradual yearly decline. Meanwhile, employment in manufacturing sustained a 5.6% increase in the past decade and, in particular, after 1988 expanded at an annual rate of more than 10%. Consequently, agriculture's

share in total employment fell to 27.8% in 1990 while the share of the manufacturing sector rose to 19.5%. Employment in the mining sector shows a tendency to decrease due to decline of tin mining. In construction, a employment increased, accounting for a 6.4% share in total employment in 1990, as a reflection of recent private investment and public works. Employment in the tertiary industry also shows yearly increases along with recent expansion of economic activities. The share reached 26.5% in total employment in 1990. The Government service sector's employment also has increased year by year. However, its share decreased to 12.8% as the increase in this sector is not so high as in other sectors. As the aforesaid trends indicate, the employment has remained on the same level or decreased in the primary industry sectors such as the agriculture and mining while in manufacturing, construction and tertiary industry sectors, employment increased. It is expected that these tendencies will continue, and in particular, employment in manufacturing will grow.

According to the Economic Report 1991/92 of the Ministry of Finance, Malaysia, in 1991 increase in employment further reduced the unemployment rate to 5.6%. This rate includes those who are not actively seeking employment. If this group is excluded, the situation is close to full employment. Reflecting this is the tightening of the labor market which has resulted from the demand by many sectors not only for more skilled workers but also unskilled workers. The Employment Turnover Survey recently conducted by the Manpower Department, reports that a significant level of turnover of skilled workers is observed in the manufacturing sector at the national level in keeping with the tightening of the labor market. The sectors struggling with frequent turnover include metal fabrication, textile and garment, wood-based, electrical and electronics, printing and rubber-based industries. Shortages of skilled workers have also been reported in the construction sector.

According to the Economic Report, wages also show an upward tendency reflecting the tightening of the labor. In recent years, average wages in the manufacturing sector have increased by 6% annually while the labor intensive industries such as the textile, wood-based and rubber-based industries have registered a higher wage growth.

2.2 Present State of Industrial Development and Structural Characteristics of Industry in Malaysia

2.2.1 Historical changes in industrialization strategy and industrial development policy

In Malaysia, since gaining independence in 1957, various industrial policies have been introduced in order to promote rapid growth of the manufacturing industries. These policies were mainly aimed at attracting investment from the developed countries. Tax incentives, tariff protection and the establishment of industrial estates were introduced as promotive measures. In 1958, the Pioneer Industries Ordinance was enacted to accelerate industrial development. This ordinance provided generous tax relief and tariff protection to selected industries.

The development policy of Malaysia in the 1960s called for the expansion of the economic base through diversifying the agricultural products and promoting industrialization. As the initial step of industrialization, the Government adopted industrialization strategy based on import substitution which had been pursued in many developing countries. Under this strategy, various incentives, including tariff protection, were created to encourage the development of local industries, in particular for the manufacture of simple consumer products such as canned food and beverages for the domestic market. However, in case of Malaysia, extremely high tariff barriers were not erected, unlike the other developing countries.

In 1960, the Malayan Stock Exchange was established as a measure to provide an environment for promotion of industrialization by mobilizing private capital for industrial development. Also in the 1960s, other agencies such as the Malaysian Industrial Development Finance Berhad (MIDF), to promote industrial finance, and the Tariff Advisory Board (TAB), to promote familiarization with the system of tariff protection, were established. However, the average effective rate of protection in Malaysia was relatively low compared with other countries owing to the Government's emphasis on a liberal trade and market-oriented strategy.

In the late 1960s, in view of the limited size of the domestic market, questions were raised regarding effectiveness of the import substitution based industrialization to attain rapid expansion of industries and thereby absorb the rapidly expanding labor force. Hence, in 1968, the focus of policy shifted to export-led growth and the Investment Incentives Act was introduced to broaden the scope of incentives for industrial development.

In 1971, the New Economic Policy (NEP) was introduced and a new dimension and direction to industrialization was set force. Industrialization became an important vehicle to achieve the objectives of the NEP, particularly in terms of providing opportunities for employment and equity restructuring. With the emergence of the Non-financial Public Enterprises (NFPEs) and the regulation of commercial and industrial activities, direct public sector participation was seen in the 1970s. At the same time, efforts were made to promote private investment in industry. In 1971, export-processing or free trade zones (FTZs) were set up under the FTZ Act. Companies operating in these zones may enjoy tax holidays, exemptions from import and export duties, and unrestricted, tax-free remittance of profits and dividends. Consequentially, many subsidiaries of large foreign enterprises, assembling mainly electrical appliances and parts, built factories in the FTZs.

In 1975, the Investment Incentives Act, 1968 was amended to increase incentives available to labor-intensive industries. For firms operating outside the FTZs to enjoy similar benefits to those in the FTZs, the Customs Act of 1967 was also amended to allow the establishment of Licensed Manufacturing Warehouses (LMWs) outside the FTZs.

In the mid-1970s, arguments were put forward that despite active Government promotional efforts, the industrialization process remained largely uncoordinated and progress in achieving the NEP objectives was still limited. Taking such an environment into account, the Industrial Coordination Act (ICA) was enacted in 1975 to rationalize industrial development and provide some direction for the types of industries which would be promoted. Under the ICA, licenses were issued to those wishing to engage in manufacturing activities, subject to compliance with guidelines on equity ownership and employment structure. However, the ICA was amended in 1977 with a provision for a procedure for appeals as the Act caused some uncertainty in the investment environment.

In the 1980s, the second phase of import-substituting industrialization took place; it put emphasis on the heavy industry sector. A number of large projects such as iron and steel, cement, the national car and small engine production were initiated under the leadership of the Heavy Industries Corporation of Malaysia (HICOM). However, during this period, the world economy entered a recessionary phase as a result of the second oil crisis. In 1982, the Government was confronted with the twin-deficit problem in the fiscal and external balances as the recession was more prolonged and deeper than expected. As a countermeasure, the structural adjustment program was introduced to cut government expenditure, particularly on low-priority and import-

intensive projects. At the same time, a comprehensive policy package was announced to encourage the private sector to act as a driving force for the growth of economy. Thus from 1984 onwards, economic policy was oriented towards deregulating the economy and reducing the role of the public sector while the industrialization strategy was based on export-led growth.

Under such circumstances of economic liberalization, licensing procedures of the ICA were further liberalized in 1985 and 1986. In accordance with the amended guidelines, the level above which companies were required to obtain licenses to engage in manufacturing activity, expand production capacity or diversify product lines, was raised in 1985 from M\$250,000 to M\$1 million in terms of paid-up capital or a full-time work force of more than 50 persons. This was further increased to M\$2.5 million or a full-time work force of more than 75 persons in 1986. In the same year, in place of the Investment Incentives Act, the Promotion of

Investment Act was introduced covering small and medium-scale industries, tourism and hotel projects.

In the process of structural adjustment of economy, industrial policies were reviewed comprehensively and the Industrial Master Plan (IMP) was introduced to plot the industrialization strategy for the period 1986-95. The IMP framed policies to promote outward-oriented industries with particular emphasis on resource-based industries and diversification of the non-resource based industries, as well as several heavy industries.

In 1991, the effect of past policies and strategies were thoroughly reviewed during the formulation of the Second Outline Perspective Plan (OPP2) and the Sixth Malaysia Plan (SMP). Under these plans, Malaysia stepped forward to a renewed economic development which will be a core of industrialization as the basis of the economic growth. At present, these development plans are being implemented within the overall framework of the National Development Policy (NDP) which will enable Malaysia to become a developed nation by the year 2020.

2.2.2 Present state of manufacturing industry

Under the positive industrialization policy of the Government, industrial growth in Malaysia has been very rapid in the past two decades. As reviewed in 2.1 growth of the manufacturing industry in the latter half of the 1980s was most remarkable and value added in the sector reached nearly 29% of the GDP in real terms in 1991 as

the largest growth element of Malaysia. The manufacturing industry is also the largest export industry in Malaysia. It accounted for about 59% of total exports with such manufactured exports as electrical and electronics products, textiles and garments, etc. In terms of employment, the manufacturing industry absorbs about 20% of total employment, next to the agriculture sector including forestry and fisheries.

Production indices by sub-sector of manufacturing industry in 1985-90 are shown in Table 2-11. The electrical and electronics machinery and the rubber-based industries grew most rapidly with respective annual averages of 26.8% and 23.2%. The transport equipment, textile and garments, and wood-based industries also grew considerably, at respective rates of 14.1%, 11.6% and 11.2%. Growth of the other industries remained below 10%.

Reflecting these recent conditions, major transitions have been seen in the sectoral structure of the manufacturing industry. The food, beverage and tobacco industries which had the largest production share of 24.2% in 1985 fell to second rank with 17.5% in 1990 while the electrical and electronics industry rose in terms of its share from 17.4% to 29.8% and came to account for the largest production share in 1990. Although the production share of the chemicals and chemical products industry declined from 18.1% to 14.8% it ranked third in 1990. As for the rubber products industry, the production share in 1985 was 5.8% at 7th rank, but rose to 8.6% and 4th rank.

The production shares of the sectors following these four are: metal and metal fabrication 6.1%, wood and wood products 5.5%, non-metallic mineral products 5.2% textile and garments 4.9%, transport equipment 4.9% and petroleum products 2.7%.

Also in terms of exports, as shown in Table 2-6, the electrical and electronics industry is the largest having a 56.5% share on average in total manufactured exports in 1988-90. The textile and garments industry follows as the second largest export industry, having a 8.7% share during the same period. These two sectors account for almost 65% of exports of manufactures and about 35% of total exports. Other exports of manufactures are as follows: food products 4.7%, chemical and chemical products 4.7%, metal products 3.9%, transport equipment 3.5%, wood-based products 3.3%, rubber-based products 3.1% and non-metallic mineral products 1.7%.

Expansion of resource-based industries as well as diversification of non-resource-based industries are basic strategies for industrialization in the Industrial Master Plan (IMP) which was adopted in 1985 by the Government for long-term industrial development of Malaysia. The following 12 sectors of industries are focused with emphasis on development;

1) Non-resource-based industries (five sectors):

- Electrical and electronics
- Transport equipment
- Machinery and engineering products
- Ferrous metal
- Textile and apparel

2) Resource-based industries (seven sectors):

- Food processing
- Rubber
- Palm oil
- Wood-based
- Chemical and petrochemical
- Non-ferrous metal products
- Non-metallic mineral products

According to the production indices of manufacturing industry shown in Table 2-11, annual growth of the output of the non-resource-based industry was 19.7% on average in 1985-90 whereas that of the resource-based industry remained at 10.0%. Consequently, the ratio of the output of the non-resource-based industry in total manufacturing industry sector rose from 35.5% in 1985 to 45.7% in 1990 while that of the resource-based industry declined from 64.5% to 54.3%.

In terms of exports as shown in Table 2-6 annual growth of the non-resource-based industry was 32.4% on average in current price while that of the resource-based industry was 23.8%. Likewise, as to the ratio in all manufactured exports, the former rose from 75% in 1985 to 81% in 1990, whereas the latter's ratio fell from 25% to 19%.

Output and export targets of selected manufacturing industries indicated in the IMP are shown in Table 2-12. Although the growth of the non-resource-based industry sector as a whole surpassed targets both in terms of output and exports,

concentration in exports in the electrical and electronics industry and the textile and apparel industry is still high resulting in insufficient achievement of industrial diversification, contrary to the intent of the IMP. The resource-based industry sector also expanded both output and exports, but its status as an export industry is still low. Tasks for Malaysia henceforth are diversification of the non-resource-based sector as an export industry and enhancement of export competitiveness as well as development of resource-based export industry on the basis of the comparative advantages of Malaysia.

2.2.3 Capital structure and investment trend in manufacturing industry

The majority of the manufacturing industry in Malaysia is owned by the private sector, in particular largely by foreign affiliate companies and joint ventures with foreign companies.

In the early 1980s, the Government announced an aggressive policy for development of heavy industries. For large scale industrial projects to which private initiative is difficult to mobilize due to huge scale of investment and long gestation period required for realization, the Government initiated the development of those projects through direct investments or joint ventures with the private sector. Consequently, public investment in the manufacturing industry increased greatly, but the ratio of the public investment in the manufacturing industry sector was still not so high.

In the Survey of the Manufacturing Industry 1989, published by the Department of Statistics, Malaysia, the ratio of private investment in the manufacturing industry is about 84% in terms of the value of fixed assets of which about 38% is held by foreign capital firms or joint ventures with foreign companies.

In the past thirty years, the Government of Malaysia has made efforts to promote domestic and foreign investment by providing various incentives for investment to promote industrialization. Since after the 1970s in particular, development of export-oriented industry depended heavily on foreign investment because of deficiency of capital, technical know-how and marketing ability.

Influenced by these investment promotion incentives, private investment in the manufacturing industry expanded favorably after the 1960s. Along with the transition of the times, structural changes have been evident in private investment

corresponding to changeovers of industrialization strategy and industrial development policy of the Government. Such changes comprise three phases.

In the 1960s, private investment mainly focused on the processing of agricultural products and the import substituting industry for general consumer products and intermediates such as food products, tobacco, wood and wood products, building materials and chemicals. In the 1970s, the Government placed emphasis on development of the export-oriented and labor-intensive manufacturing industry, and made efforts to promote foreign investment by means of establishment of the FTZs and various foreign investment incentives, particularly for setting up factories in FTZs to manufacture electronic components and textile products. Consequently in this period, many foreign capital firms started production of ICs, semiconductors, textile and garments for export in the FTZs.

By the mid-1980s, investment stagnated because of the global recession. However, with recovery from the recession, foreign investment in the manufacturing industry was reactivated and became a leading element in the economic recovery of

Malaysia. In addition, in 1987, the Government commenced new industrial promotion activity which resulted in an active inducement of foreign investment which stimulated capital inflows, transfer of new technology and new markets.

Table 2-13 shows capital structure by sub-sector of manufacturing companies registered with the Malaysian Industrial Development Authority (MIDA) and in operation as of the end of 1989. There are 3,520 companies registered with M\$18 billion of paid-up capital and M\$24 billion of fixed assets. Of these, foreign companies had M\$6.4 billion of paid-up capital or 35.5% of the total and M\$9.6 billion of fixed assets or 40.2% of the total. The food industry, which is the largest, has 480 companies followed by wood and wood products industry (including furniture and fixture) which has 474 companies. Other industries which include a large number of companies are as follows: textile and garments (322), metal fabrication (293), electrical and electronics products (265), non-metallic mineral products (249), chemical (238), plastics (202), rubber-products (194), paper processing-printing-publication (181), machinery (151), and transport equipment (145). Among these, the following industries contain a high rate of foreign investment on the basis of fixed assets ratio: electrical and electronics products 85.9%, textile and garments 59.3%, rubber products 55.7% and machinery 49.9%. Foreign investment is concentrated in export-oriented industries.

Table 2-14 shows the number and capital investment of manufacturing projects by sub-sector approved by MIDA in 1987-90. As this table indicates, investment in manufacturing substantially increased after 1988 and the value of investment projects approved by MIDA in 1988-90 was M\$49.5 billion. This nearly corresponds to twice as much as the amount approved in the preceding seven years (1981-87). Of the approved investment in these three years, foreign investment was M\$31.2 billion, approximately 63% of the total. Investment by foreign interests is concentrated in the non-resource-based industries such as electrical and electronics, basic metal, metal fabrication, textile and garments, and machinery.

Private investment in manufacturing in 1988-90 grew at an annual average rate of 58%, according to the Survey of Private Investment in Malaysia, covering 400 companies every year and the Survey of New Investments in the Manufacturing Sector covering 300 companies in 1991, both conducted by Bank Negara Malaysia (BNM). This includes reinvestment by existing companies as well as new investment. The largest reinvestment was undertaken by the chemical and petrochemical industries followed by other industries such as electronics, food, non-metallic mineral products, paper products and transport equipment. Nearly 50% of the new investment was undertaken by the electrical and electronics sector and about 12% by the chemical product sector. Another 29% were distributed among five industries, namely metal fabrication, rubber products, textile and garments, petrochemical products, wood and wood products industries. The remaining 9% were in the transport equipment, paper products, non-metallic mineral products and food industries. Of this new investment, two thirds were for the non-resource based industries led by the electrical and electronics industry. Through these tendencies, it is foreseen that the manufacturing industry in Malaysia will have a higher ratio of non-resource based industry in the future.

According to these surveys, most investment projects are export-oriented, particularly in the case of foreign investment. These projects require higher technology than in the past and many are capital intensive. Also, domestic market-oriented projects often embody plans to locally manufacture parts of considerably high quality to be sold to existing producers of end products. These recent tendencies of investment suggest the direction towards which the manufacturing industries of Malaysia are headed, namely higher export orientation and diversification and enrichment of industrial structure. However, on the other hand, imports of capital goods and raw material components are likely to increase in keeping with the tendency for manufacturers to adopt higher technology which

results in more dependence on imports of machinery and equipment for production and also a large portion of raw materials and parts that must be imported.

2.2.4 Geographical distribution of manufacturing industry

Historically, industries in Malaysia have developed in Peninsular Malaysia mostly in the west coast area. Table 2-15 shows gross value of output and value added of the manufacturing industry by state based on the Survey of Manufacturing Industry in 1989. Out of 6,092 enterprises covered by the survey, the majority, namely 27% of the companies, are located in Selangor (including the Federal Territory of Kuala Lumpur), and Johor and Sabah have 13.1% each, Sarawak 11.4%, Perak 10%, Penang 9.5% and Kedah 4%. Seven states (including Kuala Lumpur) contain 88.1% of all companies surveyed. The remaining 11.9% are dispersed in the other six states and Labuan. As for the output, Selangor (when Kuala Lumpur is included) has the highest share in total national output, 33.9%. It is followed by Johor, 17.5% and Penang, 15.9%. The total of these three states is 67.3%. Otherwise, in descending order, are Negeri Sembilan, 5.8%; Sarawak, 5.3%; Perak, 5.2%; Kedah, 3.7%; and Melaka, 3.3%; these eight states account for 90.6% of the national total output.

Table 2-16 shows distribution of investment projects in manufacturing industry approved by the MIDA during the period of 1987-90. The state which has the largest number of approved projects is Selangor (including Kuala Lumpur) accounting for 31.9%, followed by Johor, 24.6%; and Penang, 13.7%; totaling to 70.2% of all projects. The sum of eight states reaches 92.9% adding the following five states, namely, Perak, 5.8%; Kedah, 5.5%; Sabah, 4%; Sarawak, 3.7%; and Melaka, 3.7%. However, in terms of capital investment, the three states, namely Selangor (including Kuala Lumpur), Johor and Penang have only 47% of all invested capital. It is because of huge oil and gas-related investment projects in Terengganu and Sarawak, and also relatively large investment in Kedah and Melaka.

It is likely that these three states of Selangor (including Kuala Lumpur), Johor and Penang will still be investment centers for general manufacturing industries, while progress of industrialization is also expected in the states of Perak, Kedah, Melaka and Sarawak. Industries related to oil and natural gas will expand in Terengganu State on the east coast of Peninsula Malaysia and Sarawak State in Borneo Island as they are located close to oil and natural gas fields.

2.2.5 Industrial linkages of manufacturing industries and present state of the SMIs

As it has been seen, diversification of manufacturing industries in Malaysia is gradually moving forward in recent years. However, heavy concentration is still observed in exports of electronics, textiles, garments, and electrical products. Further, a large number of enterprises engaged in these industries operate within the FTZs and many of them possess LMW licenses even though located outside the FTZs. As of 1991, a total of 158 companies had been established in the 11 FTZs in Malaysia. Despite the fact that they contributed significantly to exports of manufacturers and employment creation, there was little transfer of technology and few linkages with the rest of the economy since they were allowed to import free of duty necessary materials and parts and had little or no need to develop a relationships with the domestic sectors. In particular, the self-contained nature of the electronics, textile and garments industries implied few forward and backward production linkages, resulting in little technology transfer, adaption and diffusion.

According to a recent study conducted by BNM on linkages between large-scale foreign capital firms operating in the FTZs and local firms, the local content ratio is only 2% for the electrical and electronics industry and an even lower 0.5% for the textile industry. As for domestic supply linkages among manufacturers outside the FTZs, BNM's annual survey showed that the domestic content of the output from existing manufacturing companies has been rising since 1986. For the resource-based industries, the domestic content had increased from 64% of total raw material cost in 1986 to 70% in 1990. Likewise, the leading non-resource based industries have also been making progress in attaining a high level of local materials and parts procurement. The machinery and electrical appliances sub-sector had raised their domestic content from 40% in 1986 to 61% in 1990, while the transport equipment sub-sector recorded an increase from 36% to 49%. However, the industrial linkages of the manufacturing sector are still at an early stage of development, being limited in both forward and backward directions.

In a study report published recently, effects of the industrial linkages in the mid 1980s are indicated as the following indices:

	Resource-based industries	Non-resource-based industries
Backward linkage index *1) (Domestic flow)	77.0 (58.7)	69.5 (28.3)
Forward linkage index *2) (Domestic flow)	49.8 (43.1)	39.9 (29.2)

Notes: *1) Value of input goods for production of the goods, fixing the value of the produced goods as 100.

*2) Value of the above-mentioned goods used in the production of other products, fixing the value of the thus produced goods as 100.

The above analysis indicates that resource-based industry has higher linkage effects than the non-resource-based industry, in terms of both backward and forward linkage, having higher domestic flow. Particularly in the case of non-resource-based industry, the ratio of domestic flow remains at about 40% in the backward linkage which stands for a high rate of raw materials and parts procured from foreign sources. Furthermore, ratios of the forward linkage index the backward remain at about 65% even in case of the resource-based industry and merely about 40% in case of the non-resource-based industry. This signifies that a large proportion of products manufactured in Malaysia is end products for domestic or export markets and there is little consumption of domestic raw materials and intermediates. This implies simplicity of industrial structure in Malaysia.

Apparently, the industrial structure of Malaysia has not been improved or developed greatly since the mid-1980s in view of recent principal investment trends in which the end product manufacturing is still of major importance, although similar study on recent industrial linkage effects is not possible as analysis of industrial linkages based on the latest data is unavailable. Diversification and deepening of the horizontal and vertical structure of industry is a major task requiring attention to insure further development.

Specifically, the diversification and deepening of industrial structure, should be focused on:

- * development of upstream industries like heavy and chemical industries for production of raw materials, and
- * modernization of those Small and Medium-scale Industries (SMIs) which are engaged in

- production of metallic and plastic parts
- processing of industrial materials
- processing of food and agricultural products
- production of furniture and wood products and rubber products, and
- fabrication of textile and garments,

as commonly seen in the process of industrialization in advanced industrial countries and NIEs such as Korea (Rep. of) and Taiwan. In particular, modernization and expansion of SMIs is an essential element for expansion of the industrial base such as establishment of supporting industries and resource-based industries.

Table 2-17 shows the number of establishments, gross value of output and value added in the manufacturing industry by fixed assets and employment which were reported as the result of the Industrial Survey-Manufacturing, 1989. Out of 6,092 surveyed establishments, fixed assets are less than M\$1 million in 3,928, corresponding to 64.5% of the total, and 1,303 establishments are in the range of M\$1 million to M\$5 million, accounting for 21.4%. In 3,420 establishments or 56.2% of the total employment is less than 50 persons, and 1,939 establishments or 31.8% employ between 50 and 200 persons. More than 60% of total establishments hold fixed assets below M\$1 million and employ between 50 and 100 persons. 25-30% of the total establishments range between M\$1 million and M\$5 million in fixed assets and between 50 and 100 persons employed. Large-scale establishments with fixed assets above M\$5 million and employment of more than 200 persons account for only 12-14% of the total. In view of this distribution, SMIs are the majority in manufacturing industry in Malaysia. However, in terms of the gross value of output and the value-added, 60-70% of the total is contributed by large-scale establishments with fixed assets more than M\$5 million and employment above 200 persons.

Capital productivity and labor productivity by three classes of establishments in the following grouping are shown below:

Scale of establishment	Capital productivity*1)	Labor productivity*2)
Small	2.5 - 3.1	53.0 - 79.5
Fixed assets - less than M\$1 million		
Employment - less than 50		
Medium	3.5 - 5.3	82.2 - 123.4
Fixed assets - between M\$1 million and M\$5 million		
Employment - between 50 and 200		
Large	6.9 - 8.7	100.3 - 140.4
Fixed assets - more than M\$5 million		
Employment - more than 200		

Notes: *1) Capital productivity: Production output per M\$1,000 of fixed assets (Unit in M\$1,000)

*2) Labor productivity: Production output per one employee (Unit in M\$1,000)

In comparison with large-scale establishments, capital productivity of small-scale establishments is about one third and labor productivity is about one half. In case of medium-scale establishments, capital productivity is about one half and labor productivity is about 0.8 when compared with large-scale establishments.

A comprehensive grasp of the realities of SMIs is not possible at present as results of a census on SMIs conducted recently have not been published yet. However, the above figures indicate that capital and labor productivity of SMIs in Malaysia are low and, as a principal cause, the level of technology is still low.

In these circumstances, parts and components industries and supporting industries are mostly dominated by the SMIs which manufacture products for the electric equipment, transport equipment and other precision machinery industries. However, their modernization is still lagging and the scope of industrial linkages still remains limited. The resource-based industries are also dominated by the SMIs. For example, in a survey conducted in 1988, 48% of the firms in the food processing industry were firms with paid-up capital of less than M\$1 million. In both the wood-based and rubber product industries, 93% of total establishments were SMIs. In general, the SMIs have such problems as low level of technology, lack of finance and management expertise and lack of skilled labor. Therefore, the SMIs are less competitive in international markets due to their poor quality control and low R&D which results in slow product development. In the background of lagged growth of the resource-based industries, where the SMI are dominant, there are many causes

arising from the foregoing problems in the SMIs. Enhancement of quality improvement and cost competitiveness through modernization is a great task for the SMIs.

2.3 Industrial Development Plan of the Government

2.3.1 Long-term economic development policy and economic growth target

Following the First Outline Perspective Plan (OPP1), 1971-1990, the Second Outline Perspective Plan (OPP2), 1991-2000, embodying the National Development Plan (NDP) was adopted in June 1991.

As the first phase in the implementation of the OPP2, the Sixth Malaysia Plan (SMP), covering the period 1991-1995, is being implemented. The SMP elaborates the strategies as well as the programs and projects designed to achieve the objectives of NDP.

The objective of the NDP is to attain a balanced development of the economy in order to establish a more united and just society towards the realization of the ultimate objective that Malaysia becomes a fully developed nation by the year 2020 not only economically but also in all other aspects. The NDP places emphasis on increasing efforts to make the economy more resilient in meeting external changes and uncertainties, and also a need to maintain a conducive climate to attract investment into the country in order to cope with increasing competition around the world and from neighboring countries for foreign capital and investment.

Economic policies under the NDP are therefore directed towards:

- 1) strengthening the domestic sources of growth by maintaining macro-economic stability, promoting private sector efficiency and productivity, encouraging high levels of private investment, diversifying the industrial base and expanding exports; and
- 2) accelerating human resource development which can contribute to improvements in productivity and efficiency to cope with the problem of diminishing natural resources and labor supply.

After the recession of the mid-Eighties, the Malaysian economy has recovered strongly. The economic policy anticipates that this growth momentum will continue

in the 1990s, that are targeting to grow by an average rate of 7% per annum in real terms in the decade of OPP2 as compared with the average growth of 6.7% achieved during the OPP1 period.

The manufacturing sector is expected to play the leading role for achieving the GDP growth target. The target average growth rate for the manufacturing sector set at 10.5% per annum in real terms by far exceeds the growth rate envisaged for all the other sectors of the economy in the OPP2 period. Thus the manufacturing sector's share to GDP is projected to increase from 27% in 1990 to about 37% by the year 2000, making Malaysia an industrial-oriented economy, increasingly dependent on manufacturing exports for the growth of incomes and employment in the country. Manufacturing exports are projected to account for about 81% of total exports by the year 2000 as compared with 60.4% in 1990.

2.3.2 Long-term development strategy of manufacturing industry

The manufacturing industry, particularly export-oriented industry, has sustained rapid growth in recent years. Nevertheless, with recognition of risks associated with increasing competition in the export of manufactured products which Malaysia will face especially from neighboring countries which have the advantage of low labor costs, the policy plan emphasizes that Malaysia cannot rely as strongly as it does now on exports of electronics and electrical products, and textiles and garments for the growth of the export sector. Further, emphasis is placed on structure of the industrial base which remains potentially weak as it is heavily concentrated in two sub-sectors, the electrical and electronics and the textile and apparel sub-sectors. Although these two sub-sectors continue to be the major contributors to output growth and export earnings, the plan has identified several issues still to be solved. These issues are:

- 1) limited linkages both within the sub-sector and with the rest of the economy, notably with SMIs;
- 2) heavy dependency on imported technology coupled with inadequate R&D activities leading to limited product development and design capabilities;
- 3) inadequate international marketing capabilities, with exports hinging on parent companies' demand and specifications, subcontracting arrangements and GSP privileges; and

- 4) competitive advantage lying in the availability of relatively low cost, productive and skilled labor with comparatively lower wage rates vis-a-vis the NIEs and the developed countries.

Thus, in order to remain competitive in the export of manufactured goods and to sustain rapid economic growth, the NDP has adopted the development strategy of increasing productivity and further diversifying into higher value-added production, while pursuing policy reforms aimed at widening and deepening the industrial base, leading to higher value-added products and increased linkages with SMIs.

Towards this end, the NDP's development strategy for the manufacturing is as follows:

- 1) Identification of new sources of growth to further accelerate the expansion of the manufacturing sector, through:
 - a) efforts to efficiently shift resources towards more promising and rapidly growing sub-sectors which will lead towards greater diversification of products and market;
 - b) development of new products based on continued research and applications of composite, new and advanced materials; and
 - c) supporting these activities by programs aimed at improving comparative advantage by enhancing skills and technology development and upgrading the infrastructural support facilities.
- 2) Pursuance of industrial deepening in order to achieve greater value-added and linkages both vertical and horizontal, particularly in the following areas:
 - a) basic metal, fabricated metal, petroleum and transport equipment industries as well as non-metallic mineral, rubber and timber-based industries, especially those related to engineering and metal fabrication which are essential in providing the ancillary support and improving the linkages among industries;
 - b) electronic component fabrication which can enable greater backward integration and greater value-added electronic products, moving away from mere assembly activities; and

- c) any other areas where value-added products can be developed with greater linkages through further downstream activities, especially of resource-based industries such as wood and rubber products, food and beverages as well as chemicals and petrochemical products.
- 3) Further promotion and upgrading of SMIs to make them an important and viable vehicle for industrial expansion and the creation of inter-industry linkages and support, with the target of raising the contribution of SMIs in terms of value-added and labor absorption in the manufacturing sector to the level of 40% and 50%, respectively, within the next decade from the current positions of 20% and 30%. This includes:
- a) active involvement of several public agencies in promoting SMIs to provide supporting services such as training, advisory, extension and research and development related services as well as assistance in marketing activities through subcontracting and government procurement;
 - b) provision of wider access to financing on attractive terms and conditions such as the Asean Japan Development Fund (AJDF) and the Industrial Technical Assistance Fund (ITAF);
 - c) more integrated approach for the development of SMIs with better coordination and rationalization among the various public agencies to reduce conflicting priority and duplication of programs; and
 - d) major initiatives by the public agencies for identification and extension of support facilities and services to potential high growth sub-sectors of SMIs, strengthening financial and non-financial support, improvement of product quality and internationalization of SMIs, and strengthening further the modernization and technology development programs for SMIs.
- 4) Acceleration of regional dispersal of industries not only to achieve a more balanced distribution of investment but also to locate industries closer to sources of labor and raw materials. This includes:
- a) strengthening the Federal and State administrative and planning machineries to provide for a more integrated approach in the development of promoted areas;

- b) adopting an integrated approach for the development of industrial estates to provide necessary facilities and amenities; and
 - c) selecting locations for industrial specialization taking into account their comparative resource endowment, including the opening of new industrial zones and upgrading of existing ones, as well as the development of a few selected high technology industrial estates.
- 5) Expediting the restructuring and rationalization of industries which have lagged behind in growth as a result of outmoded structures of production and technology, and high cost of production. This includes the development of selected basic industries, particularly machinery and engineering, automobiles and chemicals, which can create new demand for intermediate and capital goods and services, provide new opportunities for growth, industrial technology and inter-linkages, and in particular nurture SMIs in the manufacture of component parts and intermediate products.
- 6) Export promotion of manufactured products by means of the following efforts:
- a) intensifying efforts not only to market manufactured products to traditional markets but, more importantly, to penetrate new markets;
 - b) continuing to develop aggressive marketing strategies, including joint-ventures with international corporations having strong global market links; and
 - c) improving local capability in international product promotion, product quality, design and packaging.

2.3.3 SMP's Industrial development plan

In the context of the long-term development strategy set forth in the NDP as outlined above, the SMP sets up a more specific plan for industrial development to be attained in the period of 1991-1995.

(1) Progress of industrial development in the Fifth Malaysia Plan (FMP)

During the FMP period, the development of industry was guided by the Industrial Master Plan (IMP), 1986-1995. The IMP provided a long-term

indicative plan for the development of specific sub-sectors, policy measures and areas of specific emphasis. The IMP identified 12 sub-sectors as priority sub-sectors, comprising 7 resource-based industries and 5 non-resource-based industries. These are:

A. Resource-based industries

- food processing
- rubber products
- palm oil products
- wood-based
- chemical and petrochemical
- non-ferrous metal products
- non-metallic mineral products

B. Non-resource-based industries

- electronics and electrical
- transport equipment
- machinery and engineering
- ferrous metal (iron & steel)
- textiles/apparel

The Malaysian economy grew at the high average rate of 6.7% per annum in real terms during the period, and the leading source of this growth was the manufacturing sector. Value added in the sector registered a remarkable rate of growth of 13.9% per annum, more than double the FMP target of 6.4% per annum. Correspondingly, its share in GDP rose from 19.7% in 1985 to 27% in 1990. This development marked another milestone in the nation's transition towards an industrializing economy.

While the overall performance has been commendable, the development of the manufacturing industry was still characterized by a narrow industrial base, substantially depending on two traditional sub-sectors of electric and electronic and the textile and apparel. Further, the main impetus to the rapid growth of these subsectors was provided by the expansion in exports. The export of manufactured products as a whole increased by 31% per annum during the FMP period, and as a result its share in total merchandise exports almost doubled from 32.8% in 1985 to 60.4% in 1990. The exports from those two sub-sectors accounted for nearly two-thirds of the total manufactured exports in 1990.

(2) Development thrust in SMP

The SMP's thrust for industrial development is to promote new sources of growth so as to strength and diversify the industrial base while maintaining the importance of the traditional sources of growth, namely, the electric and electronics, and textile and apparel industries. It emphasizes the development of export-oriented, high value added, high technology industries with strong support from R&D and the growth of domestic high technology industries. The growth target and measures set in the SMP are highlighted below:

1) Sustaining the momentum of growth

* Growth target for the manufacturing sector:

- a) Sectoral growth at 11.5% per annum in real terms during the SMP period, contributing 45.8% of the increase in the total GDP. As a result of this growth the sector will account for almost one third of GDP by 1995.
- b) Expansion of the manufactured exports so that the exports by manufactures will continue to sustain the sector's growth momentum, accounting for more than 70% of the nation's merchandise export earnings by 1995.

2) Broadening and deepening the manufacturing base

- a) Further enhancing the development of new sources of growth to provide greater dynamism in an increasingly broad-based and integrated manufacturing sector. These sources include wood-based, rubber-based, oleochemicals, mineral-based, and non-metallic mineral-based industries, as well as capital and intermediate goods industries.
- b) Product improvement in terms of quality and technology, through efforts towards the establishment of a strong scientific and technical infrastructure. In this respect, the intensification of industrial R&D with greater public sector sources as well as the development of adequate industrial manpower for R&D will be pursued in line with the National Action Plan for Industrial Technology Development (APITD).

c) Promotion of greater inter-industry and sectoral linkages and the promotion of downstream activities especially in the resource-based industries.

d) Encouraging local firms to upgrade their product quality and support services so that industries located in FTZ can source their inputs from local firms.

3) Enhancing and sustaining the competitiveness of manufactured exports

a) Restructuring and modernizing selected industrial sub-sectors in terms of improvement in capacity utilization, level of technology, cost competitiveness, productivity growth and export potential, in order to ensure an efficient and competitive manufacturing sector. There are seven sub-sectors identified for on-going restructuring and modernization programs. These are:

- textiles
- wood-based
- machinery and engineering
- steel rolling
- shipbuilding and ship repairing
- automotive assembly
- palm oil processing

b) Placing emphasis towards the production of sophisticated high quality and high value added products, and productivity growth to sustain the competitive edge of the industrial sector.

4) Development of SMIs

a) Improving the capability of SMIs to supply the required production inputs of the larger enterprises and also to penetrate export markets.

b) Undertaking the development of special industrial sites for the relocation of SMIs, in particular the foundry and engineering and the timber-based industries, such as the furniture complex established in Olak Lempit, Selangor, and foundry and engineering complexes which are being planned in Perak and Selangor.

- c) Promoting the "umbrella projects" through which the Government's purchasing scheme will provide business opportunities to small-scale enterprises.
 - d) Undertaking programs for the development of international marketing network and expertise, upgrading of managerial and entrepreneurial know-how and the development of indigenous technology.
 - e) Undertaking the SMI development program particularly focusing on the supportive industries producing parts and components; mold and die; testing and tool-making; and high quality castings, forgings and other components.
 - f) Instituting efforts to link SMIs with larger enterprises through subcontracting arrangements, especially for the parts and components sub-sector and the provision of machining services, as well as the development of SMIs to provide ancillary support for the downstream activities of the electronic subsector.
- 5) Development of heavy industries
- a) Undertaking the Government's measures to ensure an orderly and sustainable development of heavy industries to strengthen the foundation for industrial growth, but placing emphasis towards greater reliance on the private sector for the development and the Government's role being essentially catalytic and supportive in nature.
 - b) Continuing, nevertheless, the Government initiatives to intervene in areas which requires huge investments and the private sector is reluctant to venture into, those including automotive, petrochemicals, iron and steel, and cement industries.
- 6) Human resource development
- a) Undertaking the Government's positive measures to encourage the private sector to train their employees to meet the increasing skill requirements. In this connection, the double deduction incentive on approved training introduced in 1987 has been reviewed to expand its scope of eligibility to include training related to productivity and quality control improvement and new manufacturing firms undertaking

the training of craft, supervisory and technical skills, as well as extending eligibility to all manufacturing firms for training conducted at approved training institutions.

- b) Introduction of a levy-grant scheme to encourage greater private sector involvement in training.
 - c) Formulating a Human Resource Development Fund which will provide incentive grants to enterprises undertaking the training of the work force in basic, enterprise-based and new emerging skills as well as retraining for higher skills.
- 7) Science and technology development
- a) Improving and strengthening public and private sector R&D organization and infrastructure in line with APITD.
 - b) Implementing quality and design enhancement programs that are readily accessible to industries, including the establishment of a number of quality enhancement centers with special emphasis on assisting SMIs which has been proposed in the APITD.

Table 2-1 Area and Population by State

	Area (sq. km)	Population (in thousand)		Density-1980 (persons/sq. km)
		1980 Census	1990 Estimate	
PENINSULAR MALAYSIA	131,598	10,960	14,617	83
Negeri Johor Darul Takzim	18,986	1,583		83
Negeri Kedah Darulaman	9,426	1,079		114
Kelantan Darul Naim	14,943	861		58
Melaka	1,650	447		271
Negeri Sembilan Darul Khusus	6,643	552		83
Negeri Pahang Darul Makmur	35,965	770		21
Pulau Pinang	1,031	902		875
Perak Darul Ridzuan	21,005	1,746		83
Perlis	795	145		182
Selangor Darul Ehsan	7,956	1,428 ^{a)}		179
Negeri Terengganu Darul Iman	12,955	526		41
F.T. Kuala Lumpur	243	921		3,790
SABAH	73,620	958 ^{b)}	1,470	13
SARAWAK	124,449	1,237	1,669	10
F.T. LUBUAN	91			
MALAYSIA	329,758	13,155	17,756	40

Notes: F.T.: Federal Territory

a) Excluding the Federal Territory of Kuala Lumpur

b) Including the Federal Territory of Labuan

Source: Department of Statistics, Malaysia, "Yearbook of Statistics 1990"

Table 2-2 Economic Indicators in the Selected Asian Countries (1989)

	Unit	Malaysia	Indonesia	Philippines	Singapore	Thailand	S. Korea	Taiwan ¹⁾
1. Land Area	sq. km	329,293	1,904,345	300,000	626	514,000	99,263	36,000
2. Population								
1) Gross Population(Mid-year)	million	17.35	179.14	60.10	2.68	55.21	42.38	20.10
2) Population Density	persons/sq. km	53	94	200	4,281	107	427	558
3. GDP								
1) GDP	million US\$	37,481	93,977	44,342	28,364	69,681	211,877	150,340 ³⁾
2) Per Capita GDP	US\$	2,160	525	738	10,584	1,262	4,999	7,480 ³⁾
3) Percent of GDP by Main Economic Sector	%							
- Agriculture, Forestry and Fishery		20.4	23.4	23.5	0.3	15.2	10.2	4.5
- Mining and Quarrying		10.2	13.1	1.7	0.1	3.5	0.6	0.4
- Manufacturing		25.1	18.4	25.0	29.7	25.4	31.3	27.8
- Construction		3.3	5.3	4.4	5.1	6.6	9.7	4.0
- Services		38.1	25.6	28.7	34.3	34.9	28.6	42.3
4. GNP								
1) GNP	million US\$	35,602	89,367	44,246	28,892	68,771	211,174	150,340
2) Per Capita GNP	US\$	2,052	499	736	10,781	1,246	4,983	7,480
5. External Trade								
- Exports	million US\$	25,037	22,159	7,821	44,675	20,082	62,377	66,201
- Imports	million US\$	22,465	16,360	10,418	49,674	25,785	61,465	52,249
6. Exchange Rate	Nat'l Currency/US\$	2.709	1,769.9	21.74	1.95	25.70	671.46 ²⁾	26.4

Note: 3) GNP

Sources: Population in 1989: UN Monthly Bulletin of Statistics

GDP and GNP: UN Monthly Bulletin of Statistics

External Trade: "Azia-Doko Nenpo (Asian Countries Yearbook) 1992

Exchange Rate: IMF IFS

1) "Taiwan Soran (Taiwan Yearbook) 1991

2) "Azia-Doko Nenpo (Asian Countries Yearbook) 1992

Table 2-3 Gross Domestic Product by Industrial Origin (In 1978 Constant Prices)

	GDP Values (million MS)					Share to GDP (%)					Change % vs. Preceding Year			Av. Annual Growth (%)	
	1980	1985	1989	1990	1991*	1980	1985	1989	1990	1991*	1989	1990	1991	1980-85	1985-90
Agriculture, Forestry and Fishery	10,190	11,854	14,767	14,821	14,836	22.9	20.8	20.5	18.7	17.3	6.0	0.4	0.1	3.1	4.6
Mining and Quarrying (of which: Petroleum)	4,487	5,985	7,385	7,749	8,043	10.1	10.5	10.2	9.8	9.3	8.6	4.9	3.8	5.9	5.3
Manufacturing	8,742	11,263	18,089	21,323	24,628	(n.a.) (4,635)	(6,073)	(6,419)	(6,727)	(-)	(8.1)	(8.4)	(8.1)	(n.a.)	(6.7)
Construction	2,066	2,738	2,380	2,844	3,271	19.6	19.7	25.1	26.9	28.7	12.0	17.9	15.5	5.2	13.6
Electricity, Gas and Water	640	948	1,344	1,513	1,687	4.6	4.8	3.3	3.6	3.8	11.6	19.5	15.0	5.8	0.8
Transport, Storage and Communication	2,543	3,630	4,859	5,447	5,999	1.4	1.7	1.9	1.9	1.9	11.0	12.6	11.5	8.2	9.8
Wholesale and Retail Trade, Hotels and Restaurants	5,383	6,911	7,748	8,754	9,717	5.7	6.3	6.7	6.9	7.0	10.1	12.1	10.1	7.4	8.5
Finance, Insurance, Real Estate and Business Services	3,686	5,094	6,770	7,655	8,535	12.1	12.1	10.7	11.0	11.3	10.9	13.0	11.0	5.1	4.8
Government Services	4,563	6,957	8,132	8,522	8,905	8.3	8.9	9.4	9.7	9.9	11.2	13.1	11.5	6.7	8.5
Other Services	1,021	1,301	1,519	1,656	1,781	10.3	12.2	11.3	10.8	10.4	4.0	4.8	4.5	8.8	4.1
Less: Imported Bank Service Charge	854	1,834	3,356	4,076	4,912	2.3	2.3	2.1	2.1	2.1	4.5	9.0	7.5	5.0	4.9
Add: Import Duties	2,045	2,245	2,442	2,947	3,433	-1.9	-3.2	-4.6	-5.1	-5.7	19.0	21.5	20.5	16.5	17.3
GDP at Market Price	44,512	57,092	72,079	79,155	85,923	4.6	3.9	3.4	3.7	4.0	14.6	20.7	16.5	1.9	5.6
						100.0	100.0	100.0	100.0	100.0	8.7	9.8	8.6	5.1	6.8

Note: * Estimates by the Ministry of Finance

Sources: Department of Statistics, "Yearbook of Statistics 1990"
Ministry of Finance, Malaysia, "Economic Report 1991/92"

Table 2-4 Gross National Expenditures by Demand Factors (In 1978 Constant Prices)

	Value of Gross National Expenditures (million Ms)					% to Gross National Expenditure					Change % vs. Preceding Year			Av. Annual Growth (%)	
	1980	1985	1989	1990	1991*	1980	1985	1989	1990	1991*	1989	1990	1991	1980-85	1985-90
A. Final Consumption Expenditure	32,195	38,659	46,563	52,103	57,547	47.0	44.3	38.4	36.8	35.5	12.6	11.9	10.4	3.7	6.2
-Public	(7,750)	(9,417)	(10,920)	(11,629)	(13,122)	(11.3)	(10.8)	(9.0)	(8.2)	(8.1)	(7.5)	(6.5)	(12.8)	(4.0)	(4.3)
-Private	(24,445)	(29,242)	(35,643)	(40,474)	(44,425)	(35.7)	(33.5)	(29.4)	(28.6)	(27.4)	(14.3)	(13.6)	(9.8)	(3.6)	(6.7)
B. Gross Fixed Capital Formation	13,931	17,888	21,212	25,872	30,314	20.4	20.5	17.5	18.3	18.7	31.9	22.0	17.2	5.1	7.7
-Public	(n.a.)	(8,396)	(7,830)	(9,166)	(10,347)	(-)	(9.6)	(6.5)	(6.5)	(6.4)	(34.3)	(17.1)	(12.9)	(-)	(1.8)
-Private	(n.a.)	(9,492)	(13,382)	(16,706)	(19,967)	(-)	(10.9)	(11.0)	(11.8)	(12.3)	(30.5)	(24.8)	(19.5)	(-)	(12.0)
C. Change in Stocks	-319	-1,262	-554	-337	59	-0.5	-1.4	-0.4	-0.2	(+)					
D. Exports of Goods and Non-factor Services	22,619	31,875	53,903	63,793	74,119	33.1	36.6	44.5	45.1	45.8	18.1	18.3	16.2	7.1	14.9
Total Expenditure	68,426	87,160	121,124	141,431	162,039	100.0	100.0	100.0	100.0	100.0	16.1	16.8	14.6	5.0	10.2
Equivalent to:															
-GDP at Market Price	44,512	57,093	72,079	79,155	85,923	65.1	65.5	59.5	56.0	53.0	8.7	9.8	8.6	5.1	6.8
-Imports of Goods and Non-factor Services	23,914	30,067	49,045	62,276	76,116	34.9	34.5	40.5	44.0	47.0	29.1	27.0	22.2	4.7	15.7
Total	68,426	87,160	121,124	141,431	162,039	100.0	100.0	100.0	100.0	100.0	16.1	16.8	14.6	5.0	10.2

Note: * Estimates by the Ministry of Finance

Sources: Ministry of Finance, Malaysia, "Economic Report" 1985-86 to 1991/92"

Table 2-5 Exports, Imports and Balance of Trade

(Unit: million M\$)

	Exports		Imports		Balance of Trade	
	Value (f.o.b.)	Change (%)	Value (c.i.f.)	Change (%)	Value	Change (%)
1980	28,172		23,451		4,721	
1985	38,017		30,438		7,579	
1986	35,319	-7.1	27,921	-8.3	7,398	-2.4
1987	45,225	28.0	31,934	14.4	13,291	79.7
1988	55,260	22.2	43,293	35.6	11,967	-10.0
1989	67,824	22.7	60,858	40.6	6,966	-41.8
1990	79,646	17.4	79,119	30.0	527	-92.4

Sources: Department of Statistics, "Yearbook of Statistics 1990"
Ministry of Finance, Malaysia, "Economic Report 1991/92"

Table 2-6 Exports of Major Commodities

(Unit: million MS)

	1980		1985		1986		1987		1988		1989		1990	
	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Crude Petroleum	6,709	23.8	8,698	22.9	5,401	15.3	6,290	13.9	6,116	11.1	7,893	11.6	10,637	13.4
LNG	-	-	2,300	6.0	1,446	4.1	1,828	4.0	1,836	3.3	2,065	3.1	2,228	2.8
Tin	2,505	8.9	1,648	4.3	650	1.9	839	1.9	911	1.6	1,161	1.7	902	1.1
Logs and Timber	3,794	13.5	3,721	9.8	4,038	11.4	5,926	13.1	5,850	10.6	7,263	10.7	7,106	8.9
Palm Oil	2,494	8.9	3,951	10.4	3,010	8.8	3,279	7.2	4,528	8.2	4,681	6.9	4,399	5.5
Rubber	4,618	16.4	2,872	7.6	3,183	9.0	3,915	8.7	5,256	9.5	3,949	5.8	3,028	3.8
Manufactured Goods	6,319	22.4	12,471	32.8	15,352	43.5	20,344	45.0	26,848	48.6	36,567	53.9	47,143	59.2
Other Commodities	1,733	6.1	2,356	6.2	2,239	6.3	2,304	6.2	3,915	7.1	4,245	6.3	4,203	5.3
Total Exports	28,172	100.0	38,017	100.0	35,319	100.0	42,225	100.0	55,260	100.0	67,824	100.0	79,646	100.0
Of which:														
Export of Manufactured Goods														
Food, Beverage and Tobacco	521	8.2	781	6.3	961	6.3	1,227	6.0	1,369	5.1	1,788	4.9	2,061	4.4
Textile, Clothing and Footwear	806	12.8	1,289	10.3	1,559	10.1	2,031	10.0	2,445	9.1	3,190	8.7	3,983	8.5
Wood Products	470	12.8	365	2.9	537	3.5	852	4.2	955	3.6	1,184	3.2	1,535	3.3
Rubber Products	84	1.3	113	0.9	239	1.6	485	2.4	919	3.4	1,148	3.2	1,356	2.9
Chemicals and Chemical Products	188	3.0	610	4.9	761	5.0	927	4.5	1,557	5.8	1,694	4.6	1,907	4.0
Petroleum Products	189	3.0	1,041	8.3	720	4.7	836	4.1	766	2.8	1,004	2.8	1,285	2.7
Non-metallic Mineral Products	61	1.0	150	1.2	191	1.2	301	1.5	450	1.7	658	1.8	771	1.6
Iron and Steel and Metal Manufactures	250	4.0	357	2.9	523	3.4	769	3.8	1,184	4.4	1,463	4.0	1,629	3.5
Electrical and Electronic Machinery and Appliances	3,016	47.7	6,493	52.1	8,492	55.3	11,000	54.1	15,162	56.5	20,799	56.9	26,496	56.2
Transport Equipment	223	3.5	566	4.5	518	3.4	701	3.4	504	1.9	1,184	3.2	2,234	4.7
Other Manufactures	511	8.1	706	5.7	851	5.5	1,215	6.0	1,537	5.7	2,455	6.7	3,886	8.2
Total	6,319	100.0	12,471	100.0	15,352	100.0	20,344	100.0	26,848	100.0	36,567	100.0	47,143	100.0

Sources: Department of Statistics, "Yearbook of Statistics 1990"
Ministry of Finance, Malaysia, "Economic Report 1991/92"

Table 2-7 Exports to the Selected Countries

(Unit: million \$)

Designation Countries	Total Exports								Manufactured	
	1980		1987		1988		1989		1990	
	Value	%	Value	%	Value	%	Value	%	Value	%
Singapore	5,385	19.1	8,198	18.1	10,689	19.3	13,395	19.7	18,141	22.8
United States	4,608	16.4	7,484	16.6	9,611	17.4	12,679	18.7	13,489	16.9
Japan	6,429	22.8	8,911	19.7	9,348	16.9	10,904	16.1	12,591	15.8
Hong Kong	530	1.9	1,269	2.8	1,920	3.5	2,085	3.1	2,525	3.2
EEC	4,774	16.9	6,433	14.2	7,984	14.5	10,434	15.4	11,865	14.9
West Germany	(1,017)	(3.6)	(1,542)	(3.4)	(1,897)	(3.4)	(2,417)	(3.6)	(3,097)	(3.9)
United Kingdom	(779)	(2.8)	(1,432)	(3.2)	(1,933)	(3.5)	(2,540)	(3.7)	(3,137)	(3.9)
France	(499)	(1.8)	(600)	(1.3)	(801)	(1.5)	(1,023)	(1.5)	(1,119)	(1.4)
Others	(2,479)	(8.8)	(2,859)	(6.3)	(3,535)	(6.1)	(4,454)	(6.6)	(4,512)	(5.7)
West Asian Countries	569	2.0	760	1.7	1,325	2.4	1,619	2.4	1,997	2.5
Rest of the World	5,877	20.9	12,170	26.9	14,383	26.0	16,708	24.6	19,038	23.9
(Countries in Asia Excluding above)	(3,521)	(12.5)	(9,087)	(20.1)	(10,639)	(19.3)	(12,027)	(17.7)	(14,619)	(18.4)
Total	28,172	100.0	42,225	100.0	55,260	100.0	67,824	100.0	79,646	100.0

Sources: Department of Statistics, "Yearbook of Statistics 1990"

Table 2-8 Gross Imports by Economic Functions

	Gross Imports by Economic Function (c.i.f., billion \$)			Average Annual Growth (%)		Share to Total (%)		
	1970	1980	1990	1970-80	1980-90	1970	1980	1990
1. Consumption Goods	1.2	4.3	12.7	13.6	11.4	28	18	16
1.1 Food	0.5	1.2	2.8	9.1	8.8	12	5	4
1.2 Consumer Durables	0.1	0.9	2.7	24.6	11.6	2	4	3
1.3 Others	0.6	2.2	7.2	13.9	12.6	14	9	9
2. Intermediate Goods	1.5	11.8	36.0	22.9	11.8	35	50	45
2.1 Materials for Manufacturing	0.9	6.7	23.4	22.2	15.5	21	28	36
2.2 Materials for Building and Construction	0.1	0.6	2.2	19.6	13.9	2	3	3
2.3 Materials for Agriculture	0.2	0.9	1.1	16.2	2.0	5	4	1
2.4 Crude Petroleum	0.1	1.9	0.4	34.2	-14.4	2	8	(*)
2.5 Others	0.2	1.7	3.9	23.9	8.7	5	7	5
3. Investment Goods	1.1	7.0	29.9	20.3	15.6	25	30	38
3.1 Machinery	0.5	2.6	9.0	17.9	13.2	11	11	12
3.2 Transport Equipment	0.1	1.0	5.8	25.9	19.2	2	4	7
3.3 Metal Products	0.3	1.7	5.0	18.9	14.2	7	7	6
3.4 Others	0.2	1.7	10.1	23.9	9.0	5	8	13
4. Re-exports	0.5	0.4	0.5	-2.2	2.3	12	2	1
Gross Imports	4.3	23.5	79.1	18.5	12.9	100	100	100

Note: (*) less than 1%

Sources: Department of Statistics, "Yearbook of Statistics 1990"

Table 2-9 Labor Force and Employment

	Labor Force (in thousand)	Employed (in thousand)	Unemployed (% of Labor Force)
1980	5,122.2	4,835.2	5.6
1987	6,408.9	5,880.8	8.2
1988	6,622.2(+3.3)	6,087.5(+3.5)	8.1
1989	6,834.1(+3.2)	6,350.8(+4.3)	7.1
1990	7,046.5(+3.1)	6,621.0(+4.3)	6.0
Growth, % (1980-90)	3.2	3.2	

Note: Figures in the Parentheses show changes % from the preceding year.

Sources: Employment and Wage Estimation Group, Comprising the Economic Planning Unit, Department of Statistics and the Ministry of Human Resource, Malaysia

Table 2-10 Employment by Sector

	Employment by Sector (in thousand)					% of Employment by Sector					Growth (%)			
	1980	1987	1988	1989	1990	1980	1987	1988	1989	1990	1980-90 (Ave.)	1987-88	1988-89	1989-90
1. Agriculture, Forestry, Hunting and Fishing	1,800.5	1,876.0	1,908.3	1,851.0	1,837.6	37.2	31.9	31.3	29.2	27.8	0.2	1.7	-3.0	-0.7
2. Mining and Quarrying	62.2	36.7	37.2	38.3	39.1	1.3	0.6	0.6	0.6	0.6	-4.5	1.4	3.0	2.1
3. Manufacturing	744.8	920.6	1,012.6	1,171.2	1,290.2	15.5	15.7	16.6	18.5	19.5	5.6	10.0	15.7	10.2
4. Construction	269.9	354.6	356.4	386.3	426.9	5.6	6.0	5.9	6.1	6.4	4.7	0.5	8.4	10.5
5. Electricity, Gas and Water	33.9	44.2	45.0	45.4	45.9	0.7	0.8	0.7	0.7	0.7	3.1	1.8	0.9	1.1
6. Transport, Storage and Communication	189.5	254.0	261.1	269.3	285.4	3.9	4.3	4.3	4.2	4.3	4.2	2.8	3.1	6.0
7. Wholesale and Retail Trade, Hotels and Restaurants	719.7	1,017.4	1,070.3	1,157.0	1,239.4	14.9	17.3	17.6	18.2	18.7	5.6	5.2	8.1	7.1
8. Finance, Insurance, Real Estate and Business Services	140.7	205.5	211.6	221.7	231.3	2.9	3.5	3.5	3.5	3.5	5.1	3.0	4.8	4.3
9. Government Services	644.3	835.9	844.3	846.6	850.2	13.3	14.2	13.9	13.3	12.8	2.8	1.0	0.3	0.4
10. Other Services	225.7	335.9	340.7	364.0	375.0	4.7	5.7	5.6	5.7	5.7	5.2	1.4	6.8	3.0
Total	4,835.2	5,880.8	6,087.5	6,350.8	6,621.0	100.0	100.0	100.0	100.0	100.0	3.2	3.5	4.3	4.3

Sources: Department of Statistics, "Yearbook of Statistics 1990"

Table 2-11 Industrial Production Indices - Manufacturing

	Production Indices (1985=100)										Weights (%)		Av. Annual
	1986	1987	1988	1989	1990	1985	1986	1987	1988	1989	1990	Growth (%)	
Food, Beverage and Tobacco	101.7	107.3	115.2	128.6	138.0	24.2	22.5	21.0	19.2	19.2	17.5	6.65	
Textile and Weaving Apparel	112.4	130.5	139.8	159.0	173.0	5.4	5.6	5.7	5.2	5.3	4.9	11.59	
Wood and Related Industries	96.6	116.4	132.4	152.1	170.1	6.1	5.4	5.8	5.6	5.8	5.5	11.21	
Rubber Products	114.4	139.3	232.6	252.9	282.9	5.8	6.1	6.5	9.2	9.0	8.6	23.21	
Chemicals and Chemical Products	115.9	129.2	139.4	151.0	156.3	18.1	19.2	19.0	17.3	16.8	14.8	9.34	
Petroleum Products	121.8	127.6	135.5	141.2	159.0	3.3	3.6	3.4	3.0	2.8	2.7	9.72	
Non-metallic Mineral Products	84.1	78.8	92.8	117.1	141.0	7.0	5.4	4.5	4.5	5.1	5.2	7.11	
Basic Metal and Metal Products	89.7	106.0	123.3	126.8	150.5	7.8	6.4	6.7	6.6	6.1	6.1	8.52	
Electrical and Electronic Machinery and Appliances	142.0	173.5	209.6	238.8	327.4	17.4	22.5	24.4	25.0	25.6	29.8	26.77	
Transport Equipment	73.3	75.8	132.8	143.7	193.5	4.9	3.3	3.0	4.4	4.3	4.9	14.11	
Manufacturing - Total	109.4	123.6	145.8	162.2	191.1	100.0	100.0	100.0	100.0	100.0	100.0	13.83	

Sources: Department of Statistics, "Yearbook of Statistics 1990"

Sources: Department of Statistics, "Yearbook of Statistics 1990"

Table 2-12 Output and Export Targets of the Selected Manufacturing Industries (1990 and 1995)

	Output (in 1981 Constant Prices)				Exports (in 1981 Constant Prices)			
	Average Annual Growth Rate (%)		Output in 1995		Average Annual Growth Rate (%)		Exports in 1995	
	1985-90 1991-95 1985-95		Value (million M\$)		1985-90 1991-95 1985-95		Value (million M\$)	
				% to Total				% to Total
Resource-based Industries	7.5	6.2	6.8	59.6	8.5	7.0	7.7	25,802 50.6
Rubber Products	8.7	8.3	8.5	7.8	8.1	9.1	8.6	3,885 7.6
Food Processing	7.3	5.0	6.2	22.3	9.8	6.0	7.9	11,528 22.6
Wood Products	6.9	6.4	6.7	9.7	4.1	12.0	8.0	4,120 8.1
Chemicals & Petrochemicals	7.3	6.2	6.8	15.3	8.9	4.7	6.8	5,869 11.5
Non-metallic Minerals	8.9	8.4	8.7	4.5	8.1	9.3	8.7	400 0.8
Non-resource-based Industries	9.9	9.5	9.7	40.4	10.4	10.2	10.3	25,165 49.4
Textiles	10.3	10.1	10.2	7.9	14.6	13.8	14.2	3,538 6.9
Basic Metal Products	9.4	8.8	9.1	6.8	4.1	4.8	4.5	2,224 4.4
Machinery & Transport Equipment	9.1	9.1	9.1	9.9	10.4	12.4	11.4	5,300 10.4
Electrical & Electronics	10.6	9.8	10.2	15.8	11.2	9.6	10.4	14,103 27.7
Total Manufacturing	8.4	7.5	7.9	100.0	9.4	8.5	8.9	50,967 100.0

Source: Industrial Master Plan, 1986-1995

Table 2-13 Capital Structure by Industry of Companies in Production (Registered in MIDA, As at End of 1989)
(Unit: million Ms)

	No. of Companies	Paid-up Capital						Fixed Assets					
		Malaysian			Foreign			Malaysian			Foreign		
		Value		%	Value		%	Value		%	Value		%
		Total	%	Investment	Total	%	Investment	Total	%	Investment	Total	%	Investment
Food Manufacturing	480	2,204.1	19.0	981.6	15.3	3,185.7	17.7	2,183.5	15.2	912.3	9.5	3,085.8	12.9
Beverage & Tobacco	62	201.4	1.7	461.1	7.2	662.5	3.7	188.4	1.3	415.1	4.3	603.5	2.5
Textile Products	332	944.7	8.1	610.0	9.5	1,554.7	8.6	431.5	3.0	629.1	6.5	1,060.6	4.4
Leather Products	25	34.0	0.3	20.4	0.3	54.4	0.3	36.2	0.3	49.7	0.5	85.9	0.4
Wood Products	422	923.5	7.9	99.9	1.6	1,023.4	5.7	862.9	6.0	148.2	1.5	1,011.1	4.2
Furniture & Fixtures	52	111.3	1.0	25.4	0.4	136.7	0.8	52.2	0.4	29.9	0.3	82.1	0.3
Paper, Printing and Publishing	181	778.9	6.7	88.2	1.4	867.1	4.8	1,577.2	11.0	178.3	1.8	1,755.5	7.3
Chemical Products	238	1,103.8	9.5	459.1	7.2	1,562.9	8.7	1,885.0	13.1	577.1	6.0	2,462.1	10.3
Petroleum and Coal	31	573.2	4.9	515.7	8.1	1,088.9	6.0	1,564.3	10.9	1,229.9	12.7	2,794.2	11.7
Rubber Products	194	367.5	3.2	248.3	3.9	615.8	3.4	497.4	3.5	625.6	6.5	1,123.0	4.7
Plastics Products	202	245.7	2.1	78.6	1.2	324.3	1.8	358.2	2.5	131.3	1.4	489.5	2.0
Non-metallic Mineral Products	249	1,190.7	10.2	518.3	8.1	1,709.0	9.5	1,793.3	12.1	905.3	9.4	2,644.6	11.0
Basic Metal Products	89	701.8	6.0	283.0	4.4	984.8	5.5	907.8	6.3	277.2	2.9	1,185.0	4.9
Fabricated Metal Products	293	650.8	5.6	268.2	4.2	919.0	5.1	523.2	3.7	201.1	2.1	724.3	3.0
Machinery Manufacturing	151	237.1	2.0	130.5	2.0	367.6	2.0	170.7	1.2	170.0	1.8	340.7	1.4
Electrical and Electronic products	265	436.2	3.8	1,225.0	19.1	1,661.2	9.2	433.6	3.0	2,649.8	27.5	3,083.4	12.9
Transport Equipment	145	800.1	6.9	239.9	3.8	1,040.0	5.8	787.0	5.5	258.8	2.7	1,045.8	4.4
Scientific and Measuring Equipment	22	6.3	0.1	73.0	1.1	79.3	0.4	4.7 (*)		147.7	1.5	152.4	0.6
Miscellaneous	87	115.3	1.0	71.9	1.1	187.2	1.0	150.0	1.0	104.6	1.1	254.6	1.1
Total	3,520	11,626.4	100	6,398.1	100	18,024.5	100	14,843.1	100	9,641.0	100	23,984.1	100

Note: (*) less than 0.1%

Source: MIDA

Table 2-14 Capital Investment in Approvals Granted for Establishment of Manufacturing Projects by Industrial Sub-Sectors (1987-1990)
(Unit: Capital Investment: million M\$)

	1987			1988			1989			1990			Change (%) in			% to Total		
	Number	Capital Investment	Number	Capital Investment	Number	Capital Investment	Number	Capital Investment	Number	Capital Investment	Number	Capital Investment	Capital Investment	Capital Investment	Capital Investment	Capital Investment	Capital Investment	Capital Investment
Food Manufacturing	28	588.6	38	969.4	31	495.6	36	570.8	65	-49	15	15.0	10.7	4.1	2.0			
Beverage & Tobacco	3	5.4	5	25.6	2	8.6	3	38.8	374	-66	351	0.1	0.3	0.1	0.1			
Textile Products	44	112.5	70	322.0	102	670.9	124	1,194.7	186	108	78	2.9	3.5	5.5	4.2			
Leather Products	-	-	1	0.4	6	21.4	8	33.4	(+)	(+)	56	-	(*)	0.2	0.1			
Wood Products	22	272.1	44	447.5	74	1,566.6	85	1,737.7	64	250	11	6.9	4.9	12.8	6.2			
Furniture & Fixtures	2	2.4	27	93.8	35	176.9	47	188.9	(+)	89	7	0.1	1.0	1.4	0.7			
Paper, Printing and Publishing	13	252.8	12	49.6	22	499.1	40	1,140.7	-80	906	129	6.4	0.5	4.1	4.1			
Chemical Products	15	355.8	20	961.8	32	1,269.0	45	3,025.7	170	32	138	9.0	10.6	10.4	10.7			
Petroleum and Coal	-	-	1	1,085.0	4	614.6	3	3,408.9	(+)	-43	455	-	11.9	5.0	12.1			
Rubber Products	56	339.2	296	1,532.7	86	556.5	34	138.9	352	-64	-75	8.6	16.9	4.6	0.5			
Plastics Products	9	170.3	21	484.2	39	358.7	49	535.6	184	-26	49	4.3	5.3	2.9	1.9			
Non-metallic Mineral Products	8	124.2	21	170.1	23	578.6	53	494.0	37	240	-15	3.2	1.9	4.7	1.8			
Basic Metal Products	21	553.5	13	1,227.7	37	654.1	26	9,054.0	122	-47	(+)	14.1	13.5	5.4	32.1			
Fabricated Metal Products	11	26.9	18	330.1	39	726.7	52	537.6	(+)	120	-26	0.7	3.6	5.9	1.9			
Machinery Manufacturing	7	32.1	14	32.1	31	180.2	36	1,275.8	0	461	608	0.8	0.4	1.5	4.5			
Electrical and Electronic products	71	819.4	95	1,252.9	174	3,036.3	213	4,211.8	53	142	39	20.8	13.8	24.9	15.0			
Transport Equipment	15	249.3	19	61.4	28	503.4	23	343.7	-75	720	-32	6.3	0.7	4.1	1.2			
Scientific and Measuring Equipment	-	-	3	13.9	5	210.3	4	78.9	(+)	(+)	-62	-	0.1	1.7	0.3			
Miscellaneous	8	29.4	14	33.7	22	87.9	25	158.2	15	161	80	0.8	0.4	0.7	0.6			
Total	333	3,933.9	732	9,039.9	792	12,215.4	906	28,168.1	131	34	131	100	100	100	100	100	100	100
In which:																		
Foreign Investment	269	2,060.0	578	4,878.0	695	8,652.7	815	17,629.1	137	77	104	52.4	53.6	70.8	62.6			

Note: (+) increases by more than 1000% (*) less tha 0.1%

Source : MIDA

Table 2-15 Principal Statistics of Manufacturing Industries by State, 1989 Survey

State	Number of Establishment	Gross Value of Output (million MS)	Cost of		Value Added (million MS)	Ratio to Industry (%)		
			Input (million MS)	Added (million MS)		Number of Establishments	Gross Value of Output	Value Added
Total	6,092	80,802	60,211	20,592		100.0	100.0	100.0
Johor	797	14,166	11,407	2,759		13.1	17.5	13.4
Kedah	243	2,957	2,098	859		4.0	3.7	4.2
Kelantan	129	575	413	162		2.1	0.7	0.8
Melaka	157	2,635	2,118	517		2.6	3.3	2.5
Negeri Sembilan	145	4,692	3,781	911		2.4	5.8	4.4
Pahang	163	2,805	2,295	510		2.7	3.5	2.5
Pulau Pinang	577	12,831	9,908	2,923		9.5	15.9	14.2
Perak	607	4,196	3,073	1,123		10.0	5.2	5.5
Perlis	16	265	175	90		0.3	0.3	0.4
Selangor	1,096	24,178	17,525	6,653		18.0	29.9	32.3
Terengganu	96	1,131	777	355		1.6	1.4	1.7
Federal Territory(K.L.)	547	3,257	2,032	1,226		9.0	4.0	6.0
Federal Territory(Labuan)	26	624	387	237		0.4	0.8	1.2
Sabah	798	2,170	1,585	585		13.1	2.7	2.8
Sarawak	695	4,319	2,638	1,681		11.4	5.3	8.2

Source: Department of Statistics, Malaysia, "Industrial Survey - Manufacturing, 1989"

Table 2-16 Capital Investment in Approvals Granted for Establishment of Manufacturing Projects by State (1987 - 1990)

	1987		1988		1989		1990		Aggregated (1988-1990)		% to Total Aggregated (1988-1990)		Change % in Capital Investment	
	Number of Project	Capital Investment	Number of Project	Capital Investment	Number of Project	Capital Investment	Number of Project	Capital Investment	Number of Project	Capital Investment	Number of Project	Capital Investment	1988	1990
Johor	82	703.0	183	1,829.5	211	2,736.1	204	2,090.0	680	7,358.6	24.6	13.8	160	50 -24
Kedah	10	90.1	45	269.5	33	600.2	65	3,992.6	153	4,952.4	5.5	9.3	199	122 565
Kelantan	3	2.8	7	44.0	6	25.6	3	19.1	19	91.5	0.7	0.2	(+)	-42 -25
Melaka	9	117.9	25	1,252.7	38	602.6	29	409.1	101	2,382.3	3.7	4.4	963	-52 -32
Negeri Sembilan	9	135.4	16	63.3	17	183.0	36	1,308.0	78	1,689.7	2.8	3.2	-53	189 615
Pahang	7	117.1	21	672.3	14	848.6	18	517.0	60	2,155.0	2.2	4.0	474	26 -39
Pulau Pinang	59	635.7	73	729.6	115	1,183.1	132	1,867.2	379	4,415.6	13.7	8.3	15	62 58
Perak	12	33.5	43	215.2	37	295.1	68	877.3	160	1,421.1	5.8	2.6	542	37 197
Perlis	-	-	1	4.4	5	23.3	2	4.9	8	32.6	0.3	(*)	(+)	430 -79
Selangor	105	1,706.5	238	2,245.3	211	3,950.6	237	4,850.5	791	12,752.9	28.6	23.9	32	76 23
Terengganu	2	6.2	10	158.9	8	127.1	5	10,748.0	25	11,040.2	0.9	20.7	(+)	-20 (+)
Federal Territory(K.L.)	15	269.5	26	65.8	22	65.6	29	138.4	92	539.3	3.3	1.0	-76	(-) 111
Federal Territory(Labuan)	3	12.3	2	12.1	-	-	-	-	5	24.4	0.2	(*)	-2	- -
Sabah	12	58.3	28	177.8	36	635.2	34	285.5	110	1,156.8	4.0	2.2	205	257 -55
Sarawak	5	45.6	14	1,353.5	39	939.3	44	1,060.5	102	3,398.9	3.7	6.4	(+)	-31 13
Total	333	3,933.9	732	9,093.9	792	12,215.4	906	28,168.1	2,763	53,411.3	100.0	100.0	131	34 131

Notes: (+) increases by more than 100% (-) decreases by less than 1% (*) less than 0.1%

Source: MIDA

Table 2-17 Number of Establishments, Gross Value of Output and Value Added of Manufacturing Industries - 1989 Industrial Survey

	Number of Establishments		Gross Value of Output (GVO)		Value Added (VA)		Ave. GVO per Establishment (million MS)		Ave. VA per Establishment (million MS)	
	Number	%	Value (million MS)	%	Value (million MS)	%	Value (million MS)	%	Value (million MS)	%
FIXED ASSETS (1,000MS)										
Below 1,000	3,928	64.5	7,357	9.1	2,005	9.7	1.87		0.51	
1,000<5,000	1,303	21.4	13,776	17.0	3,264	15.9	10.57		2.50	
5,000 and above	861	14.1	56,669	73.8	15,323	74.4	69.30		17.80	
Total	6,092	100.0	80,802	100.0	20,592	100.0	13.26		3.38	
EMPLOYMENT (persons)										
Below 50	3,420	56.2	5,428	6.7	1,345	6.5	1.59		0.39	
50<200	1,939	31.8	23,929	29.6	5,074	24.7	12.34		2.62	
200 and above	733	12.0	51,445	63.7	14,173	68.8	70.18		19.34	
Total	6,092	100.0	80,802	100.0	20,592	100.0	13.26		3.38	

Source: Department of Statistics, Malaysia, "Industrial Survey - Manufacturing, 1989"

CHAPTER 3

MEASUREMENT SYSTEM AND TECHNICAL REGULATIONS

3. MEASUREMENT SYSTEM AND TECHNICAL REGULATIONS

A measurement system is a technical basic necessity for the orderly running of a country and is utilised in combination with legal technical regulations. The main objectives of measurement regulations are the maintenance of fair trading practices, ensuring of the health and safety of the public and protection of the environment. The development of industries and the economy generally expands the scope of the role played by the measurement system with more occasions on which measurement results play a decisive role.

The Weights and Measures Act in Malaysia has been introduced to ensure fair trade but its regulatory functions are mainly centred on that equipment used for metric measurement, such as "balances", "rules" and "measures". The subject area for administrative measurement regulations is comparatively limited. At the same time, the absence of a consistent measurement system and/or national standards relating to measurement requirements in such administrative areas as transport, telecommunications and pollution control, etc. has prompted examination of the possible introduction of a measurement system by the relevant government ministries and agencies.

Urgent examination of the issues described below appears necessary to establish the correct legal framework to improve and consolidate the national measurement system.

3.1 Legal Metrology System

A weights and measures act mainly aims at maintaining economic order. As the types of measurements required to ensure fair trade are diverse, however, it is very common for the subjects of technical regulations, such as the official inspection and approval of measuring instruments, to be restricted to those areas which have significant bearing on the protection of general consumers. While the question of how far measurement regulations should extend is an issue of national sovereignty, the global trend is for the scope of regulations to be extended in accordance with both industrial and economic development. Meanwhile, regulating methods tend to be simplified with the active use of a pattern approval system and/or certification system of the private sector together with official inspection and approval.

In Malaysia where economic development is rapidly progressing, the current Weights and Measures Act and administrative arrangements to enforce the Act are deemed inadequate to fully meet the present social requirements. Aware of the inadequacy, the Enforcement Division of the Weights and Measures Department, Ministry of Domestic

Trade and Consumer Affairs, which is the competent agency for Malaysia's national metrology affairs, has been examining suitable future measures to improve the situation. The basic improvement alternatives under examination are (i) revision and upgrading of the present Weights and Measures Act which mainly deals with the inspection of measuring equipment to a more comprehensive measurement law and (ii) introduction of a type of basic metrology law in addition to the existing Weights and Measures Act. Regardless of which of these alternatives is opted for, the establishment of uniform national measurement standards (legal metrology units and standards embodying such units) is necessary. The integration and sharing of technical measurement standards in all fields and the harmonisation of such national standards with international norms and standards are also required.

The field survey which was conducted as part of the Study obtained vital information to be used to meet the above-mentioned requirements for legal regulations. Based on the findings of the field survey team, the present main technical issues and corresponding remedial measures are outlined item-by-item below.

3.1.1 Legal Metrology Units

It appears essential for legal metrology units in Malaysia to be based on the SI in view of the ever expanding scope of Malaysia's international trade and also in view of the current common international practice. In fact, Malaysia launched a 10 year plan in 1972 to harmonize its national legal metrology units with the SI and all present legal metrology units used for trade and certification under the existing Weights and Measures Act are determined based on SI units. In some industrial areas, however, the use of such non-metric units as inches, pounds and indigenous units is permitted together with non-SI units, including the gravitational unit system. As these non-metric and non-SI units are defined in terms of conversion factors with the corresponding SI units, the SIRIM Measurement Centre is only required to maintain certain scope and accuracy of SI-based measurement standards for practical purposes. However, it is necessary for the SIRIM Measurement Centre to keep in its possession those standards and others for frequently used non-SI units to meet the demand of specific industries.

In theory, all non-SI units can be created by combining the relevant SI units provided the basic SI units (length, mass, time, electrical current, temperature quantity of substance and illumination units) are firmly maintained and supplied. Technical assurance of the social uniformity of measurement standards demands a government organization to determine the combined legal metrology units (for

example, force, pressure, volume/flow, voltage and electric power, etc.) and measurement standards and to inform/supply them to the relevant sectors. As legal standards and industrial standards are the same from a technical point of view, they can share the facilities designed to maintain and control national standards. Given the likelihood of an increased demand for administrative work in regard to measurement standards in the future, the establishment of a wide range of legal metrology units, including standards for industrial use, as soon as possible is desirable.

The present Weights and Measures Act in Malaysia sets forth the legal metrology unit for some 80 different physical quantities and is adequate for the immediate legal control purposes. The types of units of which clear definition will be required in the near future include those for protection from radiation, those relating to environmental measurements and those relating to industrial safety such as material strength and hardness, etc. Part V, Section 34 of the Weights and Measures Act stipulates that all metrology units to be used by laws and regulations must adopt the appropriate SI units and/or conversion factors listed in the Third Schedule of the Act.

3.1.2 Types and Accuracy as Required by Legal Metrology Units

In determining the scope of legal metrology, the minimum requirement appears to be the inclusion of those metrology units used for trade with the public (consumers) or which are directly related to industrial safety, transport safety and safe living. In this context, the legal determination of technical standards and compliance evaluation methods relating to the rights and duties of the public also appears essential. Although the enforcement of a law does not usually require a very high degree of accuracy, there are many types of quantities to be addressed by law. Accordingly, the methods or manner of effecting technical control are numerous. In general, the necessary tests and inspections are conducted by either a competent agency or private laboratory certified by the competent agency based on compliance with the set technical standards. In either case, a mechanism must be provided whereby consistent measurement standards are maintained and controlled with government responsibility and duly informed to related organizations. This necessity has prompted the listing of areas to be examined in connection with the Study and pending issues relating to the identified areas and points to note for the future improvement of measurement standards are summarised below.

- (1) Official Inspection or Certification of Commercial Measuring Instruments (particularly those relating to public utilities such as watt meters, gas meters, water meters, taxi meters and telephone unit counters, etc.)

At present, meters to calculate the charges for public utility services, such as electricity and gas, are controlled by the competent agencies, including the Electricity and Gas Supply Department of the Ministry of Energy, Telecommunications and Posts, Waterworks Department of the same ministry and Road Transport Department of the Ministry of Transport, while measurement standards are supplied by the SIRIM. The technical linkage between these agencies and the SIRIM, however, is generally inadequate. One example is that the verification of meters is not conducted by the competent agencies and the inspection results of private companies are simply approved.

Appropriate control of these meters in accordance with official standards is important not only for the enforcement of fair trading practices as well as for the protection of consumers but also for the progress of the rationalisation of energy use throughout the country. Moreover, such control is required for supply and demand adjustment and for taxation purposes.

As far as its purposes are concerned, the method of technical control is the same as the control method for "scales and other measuring instruments" under the Weights and Measures Act. The actual control regime should consist of pattern approval, testing and verification by the competent agencies, certification of private verification institutions and/or commissioning of such work to private companies depending on the actual circumstances. For the technical part of the regime, it is necessary to achieve unification of measurement technologies/techniques so that the development of various measurement standards can be conducted in a coherent manner. To be more specific, it is necessary to establish a system whereby the SIRIM conducts the regular calibration of standard instruments. It is also desirable for the SIRIM to conduct the pattern approval testing of meters together with the provision of a verification service or to at least conduct technical evaluation to confirm the testing results of other institutions. With regard to the certification of testing and verification institutions, confirmation of their technical competence and the traceability of measurement standards are essential. The supply of such standards should be an important function of the SIRIM.