JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF TRADE, DIRECTORATE OF METROLOGY
REPUBLIC OF INDONESIA

No. 38

THE STUDY
ON
THE DEVELOPMENT OF LEGAL METROLOGY SYSTEM
IN
THE REPUBLIC OF INDONESIA

NOVEMBER, 1994

JAPAN QUALITY ASSURANCE ORGANIZATION

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PREFACE

In response to the request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a study on the Development of Legal Metrology System in the Republic of Indonesia and entrusted the Study to the Japan International cooperation Agency (JICA).

JICA sent to the Republic of Indonesia a study team headed by Mr. Ryuichi Sasaki of Japan Quality Assurance Organization, three times between August 1993 and September 1994.

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

I do hope that this report will contribute to the promotion of the program ad enhancement of friendly relations between our two countries.

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

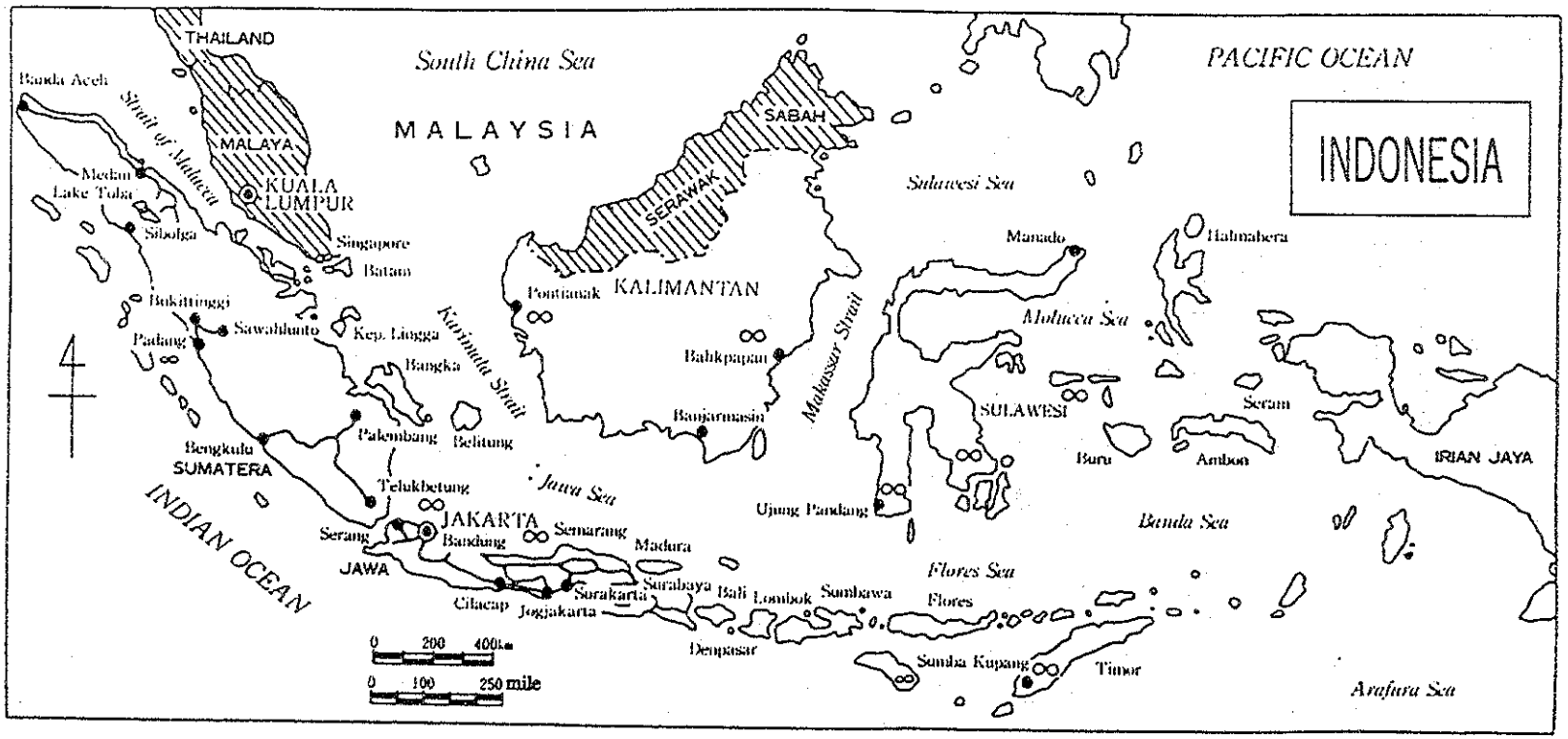
October 1994

Kimiro Fujita

President

Japan International Cooperation Agency

Indonesia Location Map



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LIST OF ABBREVIATIONS

ANSI	American National Standards Institute
APMP	Asia Pacific Metrology Programme
ASEAN	Association of Southeast Asian Nations
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Board, Indonesia)
BKPM	Badan Koordinasi Penanaman Molal (Investment Coordinating Board)
BPS	Biro Pusat Statistik (Central Bureau of Statistics)
B. I	Bank Indonesia
DOA	Department of Agriculture, Indonesia
DOM	Directorate of Metrology, Department of Trade, Indonesia
DOMA	Department of Manpower Affairs, Indonesia
DOM & E	Department of Mining & Energy, Indonesia
DOF	Department of Forestry, Indonesia
DOH	Department of Health, Indonesia
DOI	Department of Industry, Indonesia
DOPW	Department of Public Works, Indonesia
DOT	Department of Trade, Indonesia
DSN	Dewan Standardisasi, Nasional (Standardization Council of Indonesia)
IAEA	International Atomic Energy Agency
IEC	International Electrotechnical Commission
ILAC	International Laboratory Accreditation Conference
ISO	International Organization for Standardization
JETRO	Japan External Trade Organization
JIS	Japan Industry Standards
JNK	Jaringan Nasional Kalibrasi (National Calibration Natwork)

MOI	Ministry of Industry, Indonesia
NDIO	National Development Information Office, Indonesia Instrumentation and Metrology-Indonesia Institute of Science
NIEs	Newly Industrializing Economies
OIML	International Organization of Legal Metrology
PDAM	Regional Company of Water Supply
PLN	Perusahaan Listrik Negara (Regional Company of Electric Supply)
PUSLITBANG KIM-LIPI	Pusat Penelitian dan Pengembangan Kalibrasi Instrumentasi Metrologi—Lembaga Ilmu Pengetahuan Indonesia (Research and Development Center for Calibration, Instrumentation and Metrology Indonesian Institute of Science)
SLI	Standar Listrik Indonesia (Indonesia Electric Standards)

FOREWORD

The present report compiles the findings of the Study for the Legal Metrology Promotion Programme in the Republic of Indonesia (the Study) conducted by the Japan International Cooperation Agency (JICA) at the request of the Government of Indonesia (Department of Trade) to prepare a master plan for the development of the legal metrology system in the Republic of Indonesia.

In conducting the Study and preparing the report, a series of close consultations took place with the DOM, the Indonesian counterpart for the Study, in terms of the study procedure and schedule and the Study was conducted with the full cooperation of Indonesian government organizations, including the DOM, Department of Trade, Department of Industry, BAPPENAS and KIM-LIPI.

The scope of the Study was not limited to the legal metrology system but included related fields which are essential parts of the system's development. The study items were largely classified into the following 5 categories.

(1) Economy and Industry

(2) Legal Metrology (Legal Regulations on Metrology)

(3) National Metrological Standards

(4) Verification System and Its Conditions

(5) Industrial Metrology System and Traceability System

Field surveys were conducted between August 25 and September 29, 1993 and between February 9 and March 1, 1994. In addition, the draft final report was explained to the Indonesian side between September 11 and September 22, 1994.

In principle, the field surveys involved direct visits to the DOM, local verification laboratories controlled by the local offices of the Department of Trade, other government agencies, universities, private enterprises and factories, etc. The surveys were conducted in more than 10 cities in addition to Jakarta and Bandung, the two cities in which the main work was conducted. With the cooperation of the DOM, a questionnaire was sent to those local verification laboratories which the survey team was unable to visit to ensure the maximum gathering of relevant information and data.

Despite such problems as a shortage of statistical data and the lack of a verification equipment register, etc., the field surveys progressed well. The successful presentation of a master plan based on the current conditions of the legal metrology system in Indonesia in the report would not have been possible without the active assistance and work of all the people related to the Study. We would particularly like to express our gratitude to those listed below.

Mr. G. M. Putera	DOM Director
H.M. Hamin Ruba'i, SH	DOM Head of Sub Directorate of Metorological Facilities
Mr. Hari Prawoko	
Mr. Oke Nurwan	
Mr. Cecep Mufti	
Mr. Timan	

The names of the Japanese Study Team members are also listed below for convenience in the case of any future enquiry regarding the report.

Mr. Ryuichi Sasaki	Team Leader	Japan Quality Assurance Organization (JQA)
Mr. Shuichi Watanabe	Physical Quantities (A)	Nagano Seisakusho, Ltd.
Mr. Kazutoshi Shinnou	Physical Quantities (A)	Nagano Seisakusho, Ltd.
Mr. Makoto Katayama	Physical Quantities (B)	JQA
Mr. Takashi Sugiyama	Electrical Quantities (A)	JQA
Mr. Toru Higuchi	Electrical Quantities (A)	JQA
Mr. Kiyohide Yonesu	Electrical Quantities (B)	Japan Electric Meter Inspection Corporation
Mr. Hiroshi Nakatsuka	Industrial Metrology (A)	JQA
Mr. Izumi Sakaya	Industrial Metrology (B)	Engineering Consulting Firms' Association
Mr. Tsutomu Matsuno	General Coordination	JQA
Mr. Shin Kojima	General Coordination	JQA

CHAPTER 1

BACKGROUND AND OBJECTIVE OF THE STUDY

CHAPTER 1

BACKGROUND AND OBJECTIVE OF THE STUDY

1.1 Background of the Study

The Republic of Indonesia has witnessed the rapid development of commercial and industrial activities and is now finding it urgently necessary to improve and consolidate the areas listed below to modernise the institutional arrangements for metrology and measurement and the verification and calibration service facilities, all of which comprise the vital base for the development of commerce and industry. Modernisation is also required to upgrade Indonesia's metrology system to the international level.

(1) Inspection and verification system based on the measurement law

(2) Training facilities to upgrade metrological inspectors and researchers

(3) Facilities of the central metrological research institute and local verification laboratories

Under these circumstances, the Government of Indonesia requested the Government of Japan to conduct a development study on the above. In response to this request, JICA sent the Project Finding Team to Indonesia in May, 1992 which subsequently concluded through consultations with the Indonesian side that it would be necessary to improve and consolidate the manpower, research ability and measuring instruments in the field of measurement in general and legal metrology in particular in Indonesia. Following this conclusion, a formal request for the development study for the present Study was made by the Government of Indonesia and the Fact Finding Team and Preliminary Study Team were sent to Indonesia in January, 1993 and March, 1993 respectively. During the field survey in the latter period, the Scope of Work for the Study was discussed and signed by both the Japanese and Indonesian sides.

1.2 Objective of the Study

The objective of the Study is the preparation of a feasible, concrete plan (master plan) to consolidate the functions of the legal metrology system in Indonesia.

1.3 Scope and Subjects of the Study

The industrial demand for consolidation of the metrological administration in Indonesia is increasing. In fact, the REPELITA V incorporates domestic trade policies designed to gradually implement various projects with the following objectives.

(1) Stabilisation of the domestic market

(2) Improvement of the competitiveness of domestic products

(3) Promotion of further market transparency

(4) Research and development of Indonesia's trade capability

(5) Provision of appropriate guidance on business activities, including marketing, and consumer protection

(6) Development of the trade infrastructure

(7) Support for improvement of the conditions of the export infrastructure

In the field of metrology, the REPELITA V calls for a qualitative improvement of the functions of metrological offices. The Study for the Legal Metrology Promotion Programme in the Republic of Indonesia intends to clarify the current conditions of the subject issues while requesting the full cooperation of the Government of Indonesia for the gathering of information and data relating to the Study itself, the REPELITA VI (fiscal 1994/1995 - fiscal 1998/1999) and the plans/programmes of government departments and agencies related to the REPELITA VI. The objective of the Study is to prepare a master plan to promote and enforce an appropriate legal metrology system centering on the DOM as described in the Scope of Work. As the Scope of Work refers to the necessity to include a staff training plan and a facility/equipment upgrading plan in the master plan to be prepared, the following scope and subjects of the Study have been adopted.

(1) Current conditions of commercial and industrial activities and the relevant administrative policies/measures, including development plans/projects

(2) Legal regulations relating to legal metrology

(3) Related legal regulations and conditions of commercial metrology (verification system)

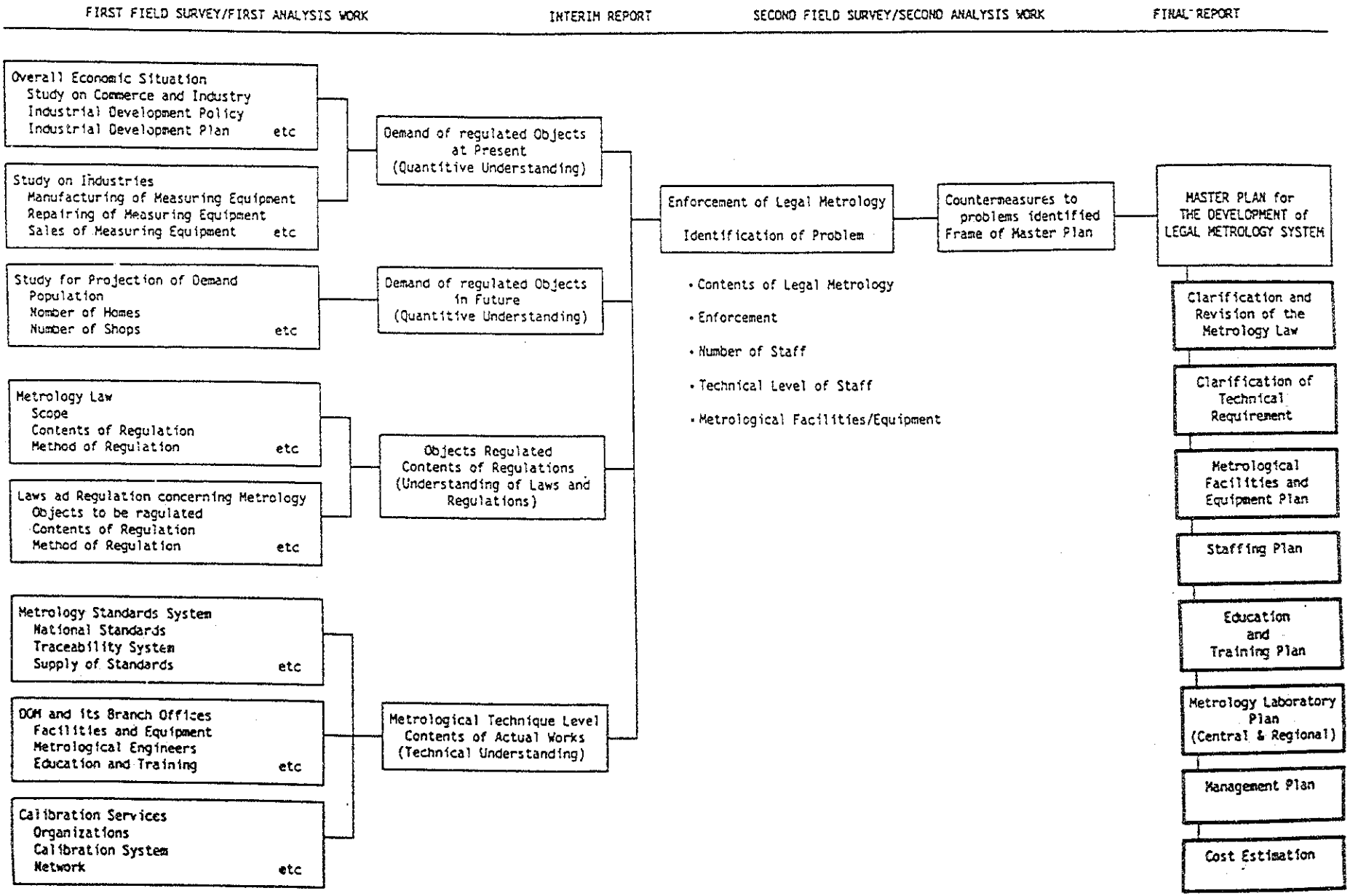
(4) National standards and the traceability system

(5) Industrial metrology (including the provision of a calibration service)

(6) Current conditions and future plan of the DOM

(7) Related issues

FLOWCHART OF THE STUDY



CHAPTER 2

CURRENT SOCIAL AND ECONOMIC CONDITIONS AND DEVELOPMENT PLANS IN INDONESIA

CHAPTER 2

CURRENT SOCIAL AND ECONOMIC CONDITIONS AND DEVELOPMENT PLANS IN INDONESIA

2.1 Current Social and Economic Conditions and Industrial Development Tasks

2.1.1 Country Data on Indonesia

(1) Land and Geography

1) Land

Indonesia is an island country consisting of as many as around 17,500 islands. It stretches from Southern Thailand on the Malay Peninsula to the northeastern part of Australia. Lying across the equator, it stretches more than 5,000km in the east-west direction and more than 1,700km in the north-south direction. It has a total land area of approximately 1.91 million km^2 and is 5.19 times larger than Japan. Indonesia is divided into 27 provinces and special districts. The locations of the provincial capitals are given in Table 2-1.

2) Geography

More than half of Indonesia's national land is covered by forests and the land is characterised by widely distributed volcanic mountain ranges. Some of the mountains in Sumatera and Irian Jaya are more than 3,000m high.

3) Climate

Indonesia has distinctive rainy and dry seasons and a tropical climate with high temperatures and high humidity is dominant throughout the country.

(2) Population

The official population census in 1990 put the population of Indonesia at 179 million, ranking 4th in the world after China, India and the US. The population is overwhelmingly concentrated on such fertile islands as Java, Madura and Bali where the population density is more than 1,000/km^2. The annual population

growth rate dropped from 2.3% in 1972 to 1.97% in 1991. As those aged 25 or younger account for 44% of the total population, Indonesia can be said to be a young country.

While there are some 300 ethnic groups, Malays are by far the majority, followed by Chinese, Indians, Pakistanis, Arabs and Eurasians.

The official language is Indonesian although some 300 languages are said to be spoken because of the ethnic diversity.

As Table 2-2 shows, the size of the population is expected to increase to 189.1 million in 1994, 192.2 million in 1995 and 204.1 million in 1999. Splitting the population between Java and other areas, Java's population will total 111.9 million in 1994, 113.4 million in 1995 and 118.9 million in 1999 while the population of other areas will total 77.2 million in 1994, 78.8 million in 1995 and 85.5 million in 1999. These estimates imply that the migration of the population from rural areas to urban areas will continue throughout the 1990's. The subject population for the period between REPELITA V and REPELITA X is estimated to be as follows.

REPELITA V	:	189.1 million
REPELITA VI	:	204.4 million
REPELITA VII	:	219.4 million
REPELITA VIII	:	233.6 million
REPELITA IX	:	246.5 million
REPELITA X	:	258.1 million

(3) Working Population

Indonesia's population has increased by approximately 1.54 times from 120 million at the commencement of the PJP I 25 years ago to 185 million today while the annual population growth rate has decreased from 2.3% 25 years ago to 1.6% today. Table 2-3 shows the population and annual population growth rate for the 27 provinces.

Despite the substantial drop of the population growth rate, Indonesia is still facing a serious population problem. The population policy has profound implications vis-a-vis economic growth, public welfare and environmental problems, etc. It is essential that the government continue policies to contain

the overall population growth and resettlement in local areas, to improve the quality of human resources and to upgrade the level of education. It is planned to increase the working population from 120 million in 1990 to 125 million by the end of REPELITA V (from April, 1994 to March, 1999) in recognition of the importance of the working population (between 15 and 60 years of age) as the productive force of the national economy. The government understands the necessity to improve health and public welfare services to extend the average life expectancy of the Indonesian people in order to increase the number of skilled, productive workers to drive the national economy forward. The development of human resources is also the target of the PJP II which is to commence in April, 1994. Another target of the PJP II is the decrease of the annual population growth rate from 1.66% at the end of the PJP I period to 1.51% at the end of the REPELITA VI period in 5 years' time and further to 0.88% at the end of the PJP II period in 25 years' time. Due to the low population increase rate in past years, the per capita income has substantially increased from 70 US$ to 650 US$ in the last 25 years. It is planned to further increase the per capita income to more than 1,000 US$ by the end of the REPELITA VI period based on an average annual increase rate of 4.7%.

The average life expectancy has also increased from 45.7 years to 62.7 years in the course of the PJP I period while the infant mortality rate has greatly declined from 145 per 1,000 to 53 per 1,000 in the same period, suggesting fairly good improvement of the health conditions of the public. The targets of the PJP II are to further increase the life expectancy to over 70 years and to decrease the infant mortality rate to 26 per 1,000. The number of poor dropped from 70 million (60% of the total population) in 1970 to 27 million (15% of the total population) in 1990. The target figure of REPELITA VI is 12 million (6% of the total population) at the end of the plan period.

REPELITA VI hopes to create 11.9 million new jobs to achieve average annual economic growth of 6.2% and expects the agricultural sector, industrial sector and other sectors to provide 1.9 million, 3 million and 7 million new jobs respectively. This massive increase of new employment is essential to achieve another target of REPELITA VI, i.e. decrease of the unemployment rate from the current 3.2% to 0.8% at the end of the plan period.

The enrolment ratio of children aged between 7 and 12 years at primary schools improved from 41% to almost 100% during the PJP I period. Similarly, the school enrolment ratio significantly increased in the same period from 17% to

53% for junior secondary schools, from 9% to 30% for senior secondary schools and from 1.6% to 10% for universities. Table 2-4 shows the school enrolment ratios for the final year of REPELITA I (fiscal 1993/94) and the projected ratios for REPELITA VI through X.

2.1.2 Outline of Economy

(1) Economic Growth and Industrial Structure

While the Indonesian economy achieved high annual growth of nearly 8% in the 1970's based on stable oil revenues, the annual growth rate has failed to improve since the late 1980's because of the decrease in oil revenues, in turn caused by low oil prices. Oil and natural gas revenues formerly accounted for 60% of the national revenue and 80% of the export earnings. Realising that such excessive dependence on oil revenues was unhealthy for the country's management, the Indonesian government tried to diversify industries. Review of the national projects became a priority policy in 1982 and new economic policies were adopted with such active structural reforms as the liberalisation of finance, taxation reform and the deregulation of imports. In 1986, the government's international revenue faced a crisis due to the plummeting oil price and the government was forced to devaluate the rupiah by 45% in September.

The government aimed at achieving an independent economy based on its rich oil revenues in the 1970's but switched to economic development led by foreign capital through the deregulation of inward investment in the early 1980's. Attempts to diversify manufacturing products based on the policy of encouraging inward foreign investment to increase exports of non-oil, non-gas products together with significant reform of the industrial structure successfully increased exports with plywood and textile products comprising the main export products. The export value of non-oil, non-gas products exceeded that of oil and natural gas for the first time in 1987.

There was a steady increase of both domestic and foreign investment between 1988 and 1990 and exports of non-oil, non-gas products continued to increase, improving Indonesia's economic strength and stimulating domestic consumption to achieve an annual economic growth rate of 7.4% in fiscal 1989. This favourable economic growth, however, was accompanied by accelerated inflation in 1990 which forced the government to adopt a tight monetary policy.

Exports declined in 1991 compared to 1990 because of the Gulf War and the continued tight monetary policy, showing uncertainty in the future.

Suharto was elected president for the sixth successive time in 1993. The new Suharto administration expressed its intention to achieve economic growth by guiding investment towards industrial development to absorb the large rural working population in the industrial sector while also aiming at curbing inflation, improving the international balance of payments and improving the poor infrastructure, including an inadequate power supply. Table 2-5 shows Indonesia's main economic indices.

The Indonesian economy has been maintaining healthy export growth since 1993 with an expected growth rate of 6.5% for fiscal 1993 and investment is said to be recovering due to the relaxation of the tight monetary policy from the middle of the year. Under these conditions, however, there is concern regarding the acceleration of inflation. Table 2-6 shows the GDP growth rate and rate of inflation from 1992 to 1994.

Nominal exports in the first half of 1993 showed a decline of 1.9% for oil and natural gas but a favourable 27.5% increase for non-oil, non-gas products. Exports for the entire year are expected to increase by 12% on the previous year which is a decline of some 4% on the performance of the year before that. Government consumption is expected to increase by 6% which is similar to the previous year's level as public servants were awarded a pay increase in April.

Investment in 1992 recorded its lowest growth since 1985 of 2.5%, mainly because of the tight monetary policy employed by the government in 1990 to improve the deteriorated foreign debt situation. This policy has caused concern in regard to the decline of both domestic and foreign investment but the prospect of a continuing export increase together with the relaxation of bank loans in May, 1993 will probably return investment to the path of recovery with annual growth of 3.4% forecast for 1993. Private consumption in 1993 is expected to record a growth rate of 3.7% which is similar to that of 1992. Import growth will be down from 7.1% in 1992 to 3.7% as a mixed result of the investment recovery and the slow-down of export growth. General prices are expected to increase by 8.9% because of the rapid increase of the money supply resulting from the monetary relaxation policy.

The Bank of Indonesia has adopted 2 basic strategies, i.e. monetary support for the favourable export growth of non-oil, non-gas products and (ii) strengthened monitoring and control of the international balance of payments. Concrete measures based on these strategies are as follows.

1) Setting of the money supply growth rate at approximately 19% to prevent the acceleration of inflation.
2) Further cutting of the lending rate as a financial support measure for plant investment by the private sector, which started to recover in the second half of 1993, and companies exporting products.
3) Strengthening of the monitoring of offshore loans and import trends.
4) Maintenance of the momentum of the deregulation policy to increase inward direct investment.
5) Strengthening of the monitoring of oil price trends.

The annual export growth rate is expected to achieve a further 3% to 15% in fiscal 1994 with continuation of the favourable export performance of non-oil, non-gas products, reflecting the economic recovery of industrialised countries. Government consumption is not expected to record a higher growth rate than the 6% expected for fiscal 1993 although public servants will be awarded another pay increase during the year. Investment is expected to increase to 4.8% as a direct consequence of the relaxation of the inward direct investment regulations in October, 1993. With the expansion of the economy, private consumption is forecast to increase by 4.2%. Imports are also expected to increase by 8.9% with intermediate and capital goods comprising the core items due to the favourable exports and recovery of investment. In all, the expected economic growth rate for fiscal 1994 of 7.1% is relatively high while general prices are expected to increase by 9.7% due to the expansion of the economy and trend of easy money.

The decline of oil prices in fiscal 1993 will inevitably affect both the domestic revenue and the international balance of payments. As shown in Table 2-7, the revenue for fiscal 1993 will be below the planned level for the oil and natural gas sector although this shortage will be adequately met by the non-oil, non-gas sector. The final revenue is expected to be 63.4 trillion Rp, exceeding the planned 62.3 trillion Rp. The export value of non-oil, non-gas products will account for some 70% of the total export value as shown in Table 2-8 and the

foreign currency reserves will e some 12 billion US$ which is equivalent to the import value for 5 months.

Table 2-9 shows the industrial structure at the end of REPELITA V. By the end of REPELITA VI, the respective share of each sector will change from 20.2% to 17.6% for agriculture, from 12.1% to 10% for mining and from 20.8% to 24.1% for the industrial sector. Detailed analysis of changes in the industrial sector reveals that the share of the non-oil, non-gas sector will increase from 17.6% to 21.3% at the expense of the oil and natural gas sector, the share of which will drop from 3.2% to 2.8%. The share of the construction sector will slightly increase from 6.4% to 7% while the share of the commerce sector will also increase from 17.1% to 17.5%. The combined share of the telecommunications sector and transport sector will increase from 5.9% to 6.4%. The GDP output share of the oil and natural gas sector will suffer a substantial decline from 12.6% to 9.8% with the non-oil, non-gas sector accounting for 90.2% compared to the previous 87.4%.

(2) International Balance of Payments and Trade

Reduction of the current account deficit has been an important item on the agenda of economic development planners in Indonesia for a long time. With the change of the basic policy orientation, exports of non-oil, non-gas products favourably increased to reduce the deficit in the second part of the 1980's. Nevertheless, increased imports have pushed up and kept the deficit amount at a high level in the 1990's. While the external borrowing of both the central government and private sector dropped in 1992, the present level of borrowing still justifies further restraint. The increased earnings of non-oil, non-gas product exports have been offset by the increased imports with the end result of a slight increase of the trade deficit. As the current deficit amount can be controlled, it is important to prevent any increase of the deficit and to maintain its size within 2% of the GDP. To achieve this target, the export growth of non-oil, non-gas products should be encouraged and the level of external borrowing should be restrained while overcoming the adverse effects of the recent oil price decline. The current targets are to lower the ratio of the remaining external debt vis-a-vis the GDP from 57% at the end of REPELITA V to 46% at the end of REPELITA VI and to also lower the DSR (debt service ratio) from 32% to 20% during the same period.

As Table 2-10 shows, the trade balance for fiscal 1994 is expected to show a surplus of 8,822 million US$ based on the high growth rate of 16.3% for non-oil, non-gas product exports although the export earnings of oil are expected to decrease by 4.9% on fiscal 1993. The import value will increase by 14.6% because of the economic recovery and the surge of exports of non-oil, non-gas products. The current account deficit will, however, worsen from 2,820 million US$ in fiscal 1993 to 3,190 million US$ due to the poor performance of the service account. The expected trade values for fiscal 1994 are given in Table 2-11.

Indonesian exports totalled 33.97 billion US$ in 1992, showing an average annual growth rate of 15.18% since 1988 when the export value was 19.22 billion US$. Imports showed an average annual growth rate of 20.96% in the same period, increasing from 13.25 billion US$ to 27.28 billion US$. While the trade surplus continuously declined from 5.97 billion US$ in 1988 to 5.8 billion US$ in 1989 and further to 3.27 billion US$ in 1991, the trend reversed in 1992 with 6.69 billion US$ being recorded.

The non-oil, non-gas sector has played a significant role in the favourable expansion of Indonesian exports. The export value of this sector for the 5 year period from 1988 to 1992 increased by an average rate of 18.63%/year, exceeding the increase rate of the total export value. The actual value increased from 11.54 billion US$ in 1988 to 23.3 billion US$ in 1992. The export value of oil and natural gas increased in the same period from 7.68 billion US$ to 10.67 billion US$ but the average annual growth rate of 9.25% was well below the growth rate recorded by the non-oil, non-gas sector.

The largest importer of Indonesian goods in 1992 was Japan, followed by the US, Singapore, the Netherlands, Germany, Hong Kong, the UK, China, Taiwan and South Korea in that order. Asian NIEs have become important markets for Indonesian products in recent years together with such industrialised countries as Japan, the US and several European countries. Japan was also the largest exporter to Indonesia, followed by the US.

The standing external debt of the Indonesian government as of December, 1992 is some 48.76 billion US$, most of which consists of loans from the IGGI composed of industrialised countries, international financial organizations and the CGI (renamed IGGI). The government spent 15.09 trillion Rp in fiscal 1992 to repay both interest and principal. The total repayment amount in fiscal 1993

is expected to be 16.71 trillion Rp (approximately 8.15 billion US$). The standing external debt at the end of 1993 jumped up to 73.36 billion US$.

(3) Regional Characteristics of Economy

The following analysis is based on a joint study report compiled by the KADIN-LP3E in Indonesia and the Institute of Developing Economies (EDE) in Japan. The GRDP (gross regional domestic product) in Indonesia is the largest for Java Island which accounts for approximately 55% (89 trillion Rp) of Indonesia's total GDP. Jakarta, which has a population of some 8 million, produces 18.4 trillion Rp alone, indicating the enormous economic gap between Java Island and other regions. The following classification is based on the characteristics and industrial structure of each region.

a. Java: densely populated area

- Population density of more than 500 persons/km^2
- GRDP of 400,000 Rp/km^2
- Well developed agriculture (rice cultivation)
- Well developed manufacturing industry
- Good infrastructure
- Good level of social services and industrial conditions
- GRDP per capita of 600,000-800,000 Rp

b. Sumatera: large plantation area

- Population density of 70-100 persons/km^2
- GRDP of 50,000-130,000 Rp/km^2
- Plantation dominated agriculture
- GRDP per capita of 500,000-900,000 Rp
- Relatively good infrastructure

c. Sumatera: oil field area

- Population density of 50-60 persons/km^2
- GRDP of 720,000 Rp/km^2 excluding oil and natural gas outputs
- GRDP of 890,000 Rp/km^2 in South Sumatera

- Natural resources, mainly oil, providing good income sources

d. Sulawesi/Nusa Tenggara: self-sufficient agricultural area
   - Population density of 50-80 persons/km^2
   - Extremely low GRDP/km^2 (approximately one-tenth and one-fifth of that of the Java and Sumatera plantation area respectively)
   - Very low level of all economic indicators

e. Kalimantan/Irian Jaya: undeveloped area
   - Sparse population with a population density of 25 persons/km^2
   - Small GRDP of 40,000-180,000 Rp/km^2
   - Undeveloped in every sense

Table 2-12 shows the industrial conditions and development possibility of each region.

2.2 Official Medium-Term Economic Development Plans and Their Tasks

2.2.1 Priority Programmes and Results of REPELITA V

(1) Outline and Targets of REPELITA V

Since it was first inaugurated in March, 1968, the Suharto administration has been implementing a series of national development plans (REPELITA). REPELITA I (from 1969/70 to 1973/74), formulated on the basis of the PJP I, was the first of these national development plans and REPELITA V is now approaching the end of its period.

The development target of REPELITA V is increased exports by the non-oil, non-gas sector which is a drastic switch of priority from oil and natural gas exports designed to change Indonesia's industrial structure. The private sector is expected to finance most of the necessary investment in the non-oil, non-gas sector. Particular emphasis is given to investment in the manufacturing sector with a target average growth rate of 8.5%/year being adopted for this sector. The successful outcome of the policy to change from development led by the oil and natural gas sector to development led by the non-oil, non-gas sector is

considered essential to achieve the stable growth of the Indonesian economy in the coming years. As the national economy currently lacks sufficient purchasing power to achieve economic growth through increased domestic demand, increase of the exports of the non-oil, non-gas sector is extremely important.

REPELITA V sets an average annual economic growth rate goal of 5%. The provisional figures so far based on the calender year are 7.5% for 1989, 7.4% for 1990, 6.2% for 1991 and 5.8% for 1992. The original estimate for fiscal 1993 is above 6%. The target export figure for fiscal 1993 is 31.8 billion US$ which is an increase of 70% on fiscal 1988. Exports by the non-oil, non-gas sector are expected to record an annual growth rate of 15-16%, accounting for 72% of the total export value in fiscal 1993.

The import value for fiscal 1993 is expected to increase to 24.2 billion US$. With a deficit of 8.125 billion US$ in service trade, the current account deficit for fiscal 1993 will be 0.5 billion US$, a great improvement on the 1.9 billion US$ deficit recorded for the previous year.

The total investment amount of the private sector, as well as foreign ODA, etc. is estimated to reach 239 trillion Rp during the REPELITA V period.

(2) Results

The economic growth rate under REPELITA V in the 4 years upto 1992 maintained a very high level. The GDP growth rate for 1992 was 6.3% while the average rate for the 4 years was 7% which was well above the target rate. This rapid growth has inevitably resulted in changes of the economic structure and the creation of a basis for the future economy and the public are benefiting from this economic development in the form of increased employment and increased income, etc.

Careful analysis of the results of the individual policies which have been implemented reveals that there has been active investment due to deregulation and administrative reform. The finalised investment amount upto fiscal 1992 already exceeds the target amount for the entire REPELITA V period. Such vigorous investment has, in fact, overheated the economy, pushing up interest rates and accelerating inflation. The tight monetary policy adopted by the government, however, has successfully cooled down economic activities to a

more acceptable level. Ordinary revenue showed a marked increase from 23 trillion Rp in fiscal 1988, the final year of REPELITA IV, to 47.5 trillion Rp in fiscal 1992. Government savings increased by approximately 8 times in the same period to 13.4 trillion Rp in fiscal 1992. The foreign currency reserves remained healthy and stable at 12 billion US$ in fiscal 1992, equivalent to 5.5 months of the export value. The current account deficit in fiscal 1992 was drastically reduced to 2.9 billion US$ from 4.4 billion US$ the previous year. The export value is also said to have increased by 15.5% in fiscal 1992 due to the substantial export increase of the non-oil, non-gas sector.

2.2.2 Priority Programmes and Targets of REPELITA VI

(1) Outline of REPELITA VI

The PJP II which commences in April, 1994 aims at achieving an average annual economic growth rate of approximately 6.2% and at increasing the GDP per capita to 1,000 US$ in 5 years. The 2nd 25 Year Long-Term Plan which commences at the same time anticipates an average annual growth rate of 7% to quadruple the current GDP per capita to overtake Asian NIEs.

(2) Targets

REPELITA VI aims at achieving an average annual economic growth rate of 6.2% throughout the plan period with the actual rate varying from 5% to 6.5% depending on the year. By sector, agriculture is expected to achieve an average annual growth rate of just under 3.5%. The expected annual growth rate for the manufacturing sector is 9% with the non-oil, non-gas sector and service sector achieving an annual growth rate of 10% and 6.5% respectively. If these targets are successfully achieved, it is estimated that the GDP per capita at the end of the REPELITA VI period will exceed the 1,000 US$ level.

Efforts to establish a stable national economy will continue with a planned annual inflation rate of below 5% and a current account deficit of below 2% of the GNP. The external debt will be maintained at a healthy level with the debt service ratio being constantly decreased to 20% at the end of the plan period. To achieve these targets, it is highly desirable that the non-oil, non-gas sector and the industry as a whole achieve an average annual growth rate of 16.5$ and 17.5% respectively.

REPELITA VI anticipates that the total investment will be double that of REPELITA V and finds it essential to increase the tax revenue from the non-oil, non-gas sector. A high level of contribution by the private sector to economic development is also hoped for.

Both REPELITA VI and the PJP II aim at pushing the Indonesian economy to the take-off stage based on the socioeconomic infrastructure for development consolidated over the 25 years since 1969. This take-off must be ensured by the development of human resources and the self-reliant development of the economy and society while firmly upholding the 3 main development principles, i.e. (i) fair distribution of the fruits of development, (ii) achievement of sustainable growth and (iii) establishment of social stability.

(3) Improved Economic Efficiency

REPELITA VI emphasises improved economic efficiency as a condition to achieve a growth rate of 6.2%. The expected contribution ratio by production element throughout the plan period is expected to decline in the case of capital and labour but to increase in the case of productivity, suggesting a future economic structure where the production output will increase despite proportionally less input of capital and labour.

While the achievement of high growth and the stabilisation of the external balance of payments are the 2 main targets from the viewpoint of the macroeconomy, these are generally antinomic provided that the economic structure remains the same. This is because high growth demands a high level of investment which in turn demands external borrowing, resulting in a worsening of the external balance of payments.

The improved economic efficiency which REPELITA VI hopes to achieve is designed to produce high growth with low investment so that the above 2 targets can be simultaneously achieved. The experience of neighbouring countries suggests that the investment efficiency tends to temporarily worsen during the take-off stage of the economy due to the high investment demand for improvement of the infrastructure and replacement of equipment and facilities. Any productivity improvement assumes strenuous efforts on the part of the government to improve the economic efficiency by means of deregulation and preservation of a competitive market, etc.

(4) Required Investment Amount

As shown in Table 2-13, total investment of 660 trillion Rp in both the public and private sectors is expected during the plan period of 5 years. Based on this figure, the annual growth rate of real investment is assumed to be 6-7% which is lower than the expected 9.3% of the REPELITA V period. This relatively low investment growth is explained by the lower setting of the economic growth rate and the expected productivity improvement. Private investment has sharply increased during the REPELITA V period, accounting for some 70% of the total investment. A similar balance between public and private investment is expected to be observed throughout the REPELITA VI period. In terms of the funding sources, as the domestic savings growth rate is expected to overshadow the investment growth rate during the REPELITA VI period, the balance between savings and investment will improve with the end result of a declining dependence on external funding to meet the domestic investment demand.

(5) Fiscal Balance

In regard to the fiscal balance, tax revenues are expected to achieve a high annual growth rate of 17.5% following the good performance during the REPELITA V period. The share of tax revenues in the domestic revenue will increase from 64.5% in fiscal 1993 to 77.8% in the final year of the plan period. The tax revenue size vis-a-vis the GDP of the non-oil, non-gas sector will also increase from 12.5% in fiscal 1993 to 15.6% at the end of the plan period and approaching the level of such neighbouring countries as Malaysia and Thailand. Consequently, the size of government savings, which is the domestic revenue minus current expenditure, will continue to increase and the government savings are expected to pay for 67.7% of the development expenditure at the end of the plan period, a positive increase from the 62.1% in fiscal 1993.

(6) External Balance of Payments

In regard to the external balance of payments, REPELITA VI anticipates an average annual growth rate of some 16.8% (dollar base) for exports throughout the plan period, led by the non-oil, non-gas sector as in the case under REPELITA V (see Table 2-14). The non-oil, non-gas sector's export value in the overall exports is expected to further increase from 75.9% in fiscal 1993 to 87.0% at the end of the plan period. The expected relatively low investment growth shown in Table 2-14 which is lower than that of the REPELITA V period will suppress the import value while improving the current balance. The ratio of the current account deficit in the GDP will decrease from 1.9% in fiscal

1993 to 1.3% at the end of the plan period. The foreign currency reserve level is expected to be constant throughout the plan period and will be equivalent to 5 months of the import value. All of the above trends will make the size of the net inflow of foreign capital smaller than in the case of the REPELITA V period, slowing the rate of increase of the external debt. Although the accumulated external debt will increase from 83.2 billion US$ at the end of fiscal 1993 to 95.8 billion US$ at the end of the plan period, its ratio vis-a-vis the GDP will actually drop from 57.2% to 45.9% in the same period. The debt service ratio is also expected to decline from 32.5% to 20.2% with public sector borrowing comprising the main area of improvement.

2.2.3 Macroeconomic Framework for PJP II (April, 1994 - March, 2019)

(1) Income Level

The PJP II intends to almost quadruple the real GDP per capita (base year: 1989) from the current 676 US$ to 2,631 US$ in 25 years. This target level has been set to ensure sustainable growth while taking the present income level of neighbouring Malaysia (approximately 2,000 US$) into consideration.

(2) Economic Growth

As Table 2-15 shows, the PJP II intends to achieve an average annual economic growth rate of some 7% throughout the plan period of 25 years with the actual yearly rate gradually increasing from 6.2% during the REPELITA VI period to 8.7% during the REPELITA X period. An annual growth rate of some 7% means doubling of the GDP in 10 years. As the average annual growth rate for the last 25 years has been in the 6% bracket, the planned growth of 7% for the next 25 years is the basis which quantitatively underpins the take-off of the Indonesian economy as planned by the PJP II.

(3) Growth by Sector

The envisaged economic growth will mainly be led by the manufacturing sector. As Table 2-15 shows, the target annual growth rate of the manufacturing sector throughout the plan period is just above 9% which is substantially higher than the 3.5% planned for the agricultural sector. Assuming the successful achievement of the planned growth for each sector, the output of the manufacturing sector will be more than 30% of the GDP at the end of the plan period, achieving a high level of industrialisation rivalling the

current level of such Asian NIEs as South Korea (29% in 1990) and Taiwan (34% in 1990).

(4) Workforce

The annual increase ratio of the working population is expected to gradually decline during the PJP II period in line with the decrease of the annual population growth rate (from 1.51% under REPELITA VI to 0.88% under REPELITA X) although the absolute number of the working population will increase by some 69.1 million.

The PJP II plans to absorb this increased working population mainly in the service and manufacturing sectors to reduce the unemployment rate. A big problem will be how to secure employment opportunities for the inadequately employed (those working less than 35 hours/week) who account for 38% of the present employed population.

(5) Fair Distribution

In addition to the basic objective of improving human resources, the PJP II gives priority to the eradication of poverty, the fostering of small businesses and the modernisation of agriculture, all of which will contribute to correcting the income gap between workers in different sectors. The plan also emphasises the correction of the regional gap through the provision of special development support for the eastern regions and other poor regions. The plan recognises the limitations of an approach which tries to establish quantitative targets for development using such economic indices as the income level and, therefore, stresses on the improvement of such social indices as the infant mortality rate, the mortality rate of pregnant women and the school enrolment rate, etc.

2.3 Current Conditions of and Future Programme for Commerce and Industry

2.3.1 Commerce

(1) Current Conditions

Little data is available to clearly indicate the share of the commerce sector in Indonesia's economy. Although large department stores and modern shopping centres stand side by side in large cities, only a limited number of official statistics on their turnover and profit, etc. are available. In the case of much

smaller shops and stalls, sufficient reliable data does not exist. The commerce-related data issued by the Central Bureau of Statistics is the only data on employment and the value-added amount of wholesalers and retailers as part of the national and regional income statistics.

Table 2-16 shows the real growth rate and share of the commerce sector (trade, hotels and restaurants) in the GDP and employment. Both its share in the GNP and employment have been virtually constant since 1988 at around 16% for the former and 15% for the latter.

Nevertheless, according to data from the Ministry of Trade, supermarkets and department stores have exhibited strong growth over the past five years (Table 2-16 and it is clear that the modernisation of the retail industry is progressing at a rapid pace.

The Programme and Steps Taken Within Domestic Trade Areas during the Period of REPELITA VI published by the Directorate of Domestic Trade of the Ministry of Trade reveals that a number of programmes and steps were taken during the REPELITA V period to achieve the following targets.

① Establishment of a market economy system

② Improvement of the price competitiveness of domestic products

③ Establishment of market transparency

④ Promotion of healthy trade practices and consumer protection

⑤ Fostering of trade institutions

⑥ Consolidation of the domestic commercial infrastructure and facilities

⑦ Expansion of the facilities and functions to assist export promotion

Some of the programmes under item ⑥, i.e. consolidation of the domestic commercial infrastructure and facilities, are actually related to metrology and call for the active utilisation of the existing equipment and facilities to consolidate the role of the Directorate of Metrology and to upgrade the training programmes for its staff.

The implementation of these programmes and steps (as of 1992) has resulted in a decrease of the inflation rate and a reduced price gap between regions. Although the causative relationship between these facts and the programmes

implemented by the Ministry of Trade is not necessarily clear, it can reasonably be said that the simplified procedure for the issue of commercial licences, the training of traders and other programmes have contributed to the improved efficiency of commercial activities in Indonesia. In the field of metrology, the product competitiveness has been improved through strict quality control based on the certification system and the regular inspection of measuring instruments. The above assessment is made by the Ministry of Trade itself although the document does not refer to issues which were not solved during the REPELITA V period. However, it may be argued that the programmes incorporated in REPELITA VI which are described next indicate these unsolved issues.

(2) REPELITA VI

The target annual growth rate for the commerce sector is set at 6.6% during the REPELITA VI period (1994-1999) which is higher than the target GDP growth rate of 6.2%/year but which is lower than the estimated real growth of 7.1% during the REPELITA V period, suggesting a conservative approach by the planner. REPELITA VI also sets a target combined growth rate for the commerce sector and transport sector for each region. A high annual growth rate of more than 10% is predicted for 3 regions, i.e. North Sumatera, Lampung and West Kalimantan (Table 2-17). The document lists the following 8 priority issues for REPELITA VI.

① Market expansion

② Diffusion of information on the domestic market

③ Improvement of the distribution channels

④ Establishment of orderly trade practices

⑤ Consumer protection

⑥ Support for the independence of small traders, informal traders and those handling traditional items

⑦ Qualitative improvement of the commercial facilities and infrastructure with care for the environment

⑧ Vitalisation of the market mechanism

Metrology is referred to under the header of consumer protection. The development of the metrological system and the quantitative and qualitative consolidation of the equipment, facilities and manpower are planned by means

of reviewing and improving the existing metrology law and related regulations and expanding the functions of organizations related to legal metrology. An action programme on metrology will be implemented in fiscal 1994 with an estimated budget of slightly more than 2.3 billion Rp.

2.3.2 Industry

(1) History of Industrialisation

Indonesia's stable economic growth since the mid-1980's has mainly been brought about by the industrial sector, particularly the progress of industrialisation culminating in the high export growth of the non-oil, non-gas sector. The growth rate of the industrial sector has always been higher than the growth rate of the general economy, underlining the large contribution by the industrial sector to the development of the Indonesian economy. While the growth of the Indonesian economy was mainly based on import substitution in the period between the late 1960's and early 1980's, export promotion came to the forefront in the mid-1980's. This change of strategy was necessitated by the decline of the oil price and the worsening market conditions for primary products in the midst of a global recession which commenced in 1982. Faced with unprecedented economic difficulties, the Indonesian government looked to the promotion of exports by the industrial sector to reduce the dependence on oil and introduced a series of measures, including relaxation of the import regulations, financial reform and devaluation, etc., all of which were designed to directly or indirectly promote exports. The successful outcome of these measures was observed with the steady export growth of industrial products in terms of both quantity and variety. The export value of non-oil, non-gas products exceeded the export value of oil and natural gas for the first time in 14 years in 1987 as the incremental portion of the total export value on the previous year was practically dominated by industrial products. The current main export items are plywood, textile products, rubber, timber, aluminium, nickel sheeting, tin, processed food and palm oil.

(2) National Development Plans

REPELITA V initially adopted the following 6 key targets for its industrialisation policy.

① Fostering of export-oriented industries

② Strengthening of the linkage between different industries

③ Employment creation through the encouragement of small-scale industries

④ Promotion of an agricultural product processing industry

⑤ Upgrading and wide diffusion of technologies

⑥ Implementation of various measures to assist industrial development

REPELITA V was formulated in 1988/89 when various deregulation measures were earnestly being implemented and at a time when a rapid export increase of non-oil, non-gas products, led by the manufacturing sector, was seen. There was an increasingly solid basis for the government to actively promote further measures to attract foreign investment as it was becoming more confident of the success of the deregulation policy. REPELITA V is now approaching its end and the performance of REPELITA V in promoting the industrial sector has been a success. In particular, the reduced dependence on oil and natural gas should be highly appreciated.

The industrial sector is considered the driving force for economic growth in REPELITA VI. With a target annual growth rate of 9.4% (10.3% for the non-oil, non-gas sector), the industrial sector will account for 24.1% of the GDP at the end of the plan period in 1999. Even though this target rate is lower than the estimated real growth rate of 10.0% during the REPELITA V period, it is still the highest target on a sector-by-sector basis under REPELITA VI. By region/province, the target growth rate of the industrial sector is particularly high for Maluku, Irian Jaya and Central Java (Table 2-18).

In the field of employment, the share of the industrial sector is expected to increase to 14.3% of the total employment by the end of the plan period. In order to improve the competitiveness of the industrial sector, REPELITA VI plans to proceed with further deregulation, administrative reform and the withdrawal/reduction of subsidies and protective measures. As industry instead of agriculture is expected to create employment opportunities during the REPELITA VI period, the promotion of high value added and technology-intensive industries is planned to be added to the existing labour-intensive industries and those industries highly dependent on natural resources.

(3) Current Conditions

The role of industry (the word "industry" here means the manufacturing sector, excluding the oil refinery and natural gas liquefaction industries which occupy

important places in the national economy) in the Indonesian economy has been becoming increasingly important in recent years. The share of the manufacturing sector in the GDP increased from 8.1% in 1988 to 20.5% in 1992. The number of workers in the manufacturing sector also increased accordingly from 8.1% to 10.5%. The export share of manufacturing products has steadily grown to reach some 58% in 1992 from 48.2% in 1988 (table 2-19).

The main characteristics of the Indonesian manufacturing industry are the dual structure in terms of business size and the uneven geographical concentration of the manufacturing bases. The former, comprising a small number of large factories with relatively high productivity and innumerable small household factories, is quite noticeable. Government statistics use 4 categories for manufacturing factories, i.e. large (100 workers or more), medium (20-99 workers), small (5-19 workers) and household (upto 4 workers). Although large factories only accounted for 0.8% of the 1.52 million factories and 32.7% of workers in the manufacturing sector in 1986, their added value accounted for 82.2% of the total. Meanwhile, household factories accounted for 93.0% of the total number of factories and 52.4% of workers. (No statistics on small and household factories have been released since 1987.)

The geographical characteristics of the manufacturing sector include a high concentration of factories of all sizes in Java and a disproportionate distribution of large factories involving the development of natural resources (such as plywood, timber, fertiliser and paper factories) in Kalimantan.

It is also worth noting that foreign investment has played a crucial role in the development of the manufacturing sector, as has been the case in other Southeast Asian countries. The approved foreign investment in the manufacturing sector totalled 37.7 billion US$ between 1967 and 1992. A recent trend is the shifting of production bases from Asian NIEs to Indonesia because of wage increases in the former.

Table 2-20 shows the recent production trends of the major manufacturing products. Apart from a substantial increase in the production of household electrical appliances, the growth of textile and yarn production due to a favourable export performance is particularly noticeable.

(4) Trends of Main Industries

The recent trends of those industries related to metrology, such as the electrical/ electronics industry and precision machinery industry, are discussed below together with the oil and petrochemical industry which commands an important position in the economy of Indonesia.

1) Electrical/Electronics Industry

The electrical/electronics industry in Indonesia has achieved remarkable growth with steady domestic, as well as foreign, investment. Domestic investment in this industry totalled 46 million US$ in 1992 while foreign investment totalled as much as 132.35 million US$. The export value of electrical/electronic products in 1992 was 1.1 billion US$ which was double the export value of the previous year. The main export destinations are ASEAN countries, Japan, Western Europe and the Middle East. Most electrical/electronic products manufactured in Indonesia are actually knock-down products for export and the components are exempt from import duties. While diverse products are manufactured, the main items are such household goods as personal computers, radios, audio-cassette players, black and white television sets and telecommunications equipment. Exports of personal computers have been explosive in that products to the value of 100 million US$ were exported in 1992, mainly to the US and Eastern Europe, a staggering fifty-fold increase on the previous year. A large proportion of the foreign investment has been poured into the computer field, the further expansion of which in the future appears to be assured. One future problem is to increase the local content without losing product quality and price competitiveness.

2) Precision Machinery Industry

There is no category for precision machinery in Indonesia's industrial statistics and the nearest category to precision machinery is probably that of professional, scientific, measuring and control equipment. The output of this category of 48.7 billion Rp (approximately 27 million US$) in 1990 was rather small. As advanced technologies are an essential part of the manufacturing activities in this field, the introduction of technologies from abroad is the key to the future development of local enterprises.

3) Oil and Petrochemical Industry

Although Indonesia is trying to set its economy free from its heavy dependence on oil, oil is still the largest source of foreign currency earnings and revenue. Oil refining is mainly conducted by PURTAMINA which produced 300 million barrels of oil products in 1992. The domestic oil refining capacity exceeds the domestic demand. As the production itinerary does not match the domestic demand, some oil products are actually imported. Following economic growth, the domestic oil demand has been rapidly increasing and it is predicted that Indonesia will become a net oil importer by the end of the century, making expansion of the oil refining capacity essential. The government is actively promoting research on alternative energies.

Within the petrochemical industry, the production of such midstream and down stream items as polypropylene, vinyl chloride resin and synthetic fibres, etc. has been steadily increasing while upstream products, except methanol and ammonia, are imported. In order to improve the supply of upstream products, the construction of an aromatic centre and an olefin centre is in progress in North Sumatera and West Java respectively.

It is planned in the future to replace oil exports with exports of high value added refined oil products and petrochemical products. Meanwhile, PURTAMINA is proceeding with plant modernisation to improve its operation rate.

2.4 Production and Trade Volumes of Measuring Instruments

2.4.1 Trends of Domestic Demand

The domestic demand in the last 3 years (1990-1992) (total of domestic production and imports, disregarding the virtually non-existent exports even though the export volume should, in principle, be deducted from the total), the number of domestic manufacturers and the main exporting countries of the main measuring instruments which are subject to the legal metrology regime are shown in Table 2-21 based on data published by the Directorate of Metrology of the Ministry of Trade.

In general, the manufacture and import of measuring instruments stayed at the same level for the subject 3 years. As the demand for measuring instruments increases in

accordance with the development of commerce and industry, it appears reasonable to forecast an increase of the future demand for measuring instruments at the same rate as the target growth rate for commerce and industry (6.6% for commerce and 9.4% for industry) adopted by REPELITA VI or more.

2.4.2 Production and Trade Trends of Main Measuring Instruments

This section describes the production and trade trends of watt-hour meters, gas meters, water meters and taxi meters among those listed in Table 2-21 based on the availability of additional data.

(1) Watt-Hour Meters

In December, 1992, the PLN announced the estimated demand for watt-hour meters upto the turn of the century (Table 2-22). The electrification rate will have reached 70% by 2000 with an estimated demand for 32 million watt-hour meters, double the demand in 1993. The number of customers, i.e. watt-hour meters, as of the end of March, 1992 by region/province and by type of customer is given in Table 2-23.

Although there are 2 types of watt-hour meters, i.e. single phase meters and three phase meters), more than 95% of the domestic demand is for single phase meters. According to the PLN, all single phase meters are manufactured and supplied to the PLN by the following 5 domestic manufacturers, 4 of which are joint ventures with foreign companies. MELCOINDA is the only domestic manufacturer of three phase meters and any supply shortage is met by imports.

- SIGMA BINA
- FUJI DHARMA (joint venture with a Japanese manufacturer)
- METBELOSA (joint venture with a Japanese manufacturer)
- MELCOINDA (joint venture with a Japanese manufacturer)
- MECOINDO (joint venture with a French manufacturer)

The following trade data and values are cited from trade statistics for 1992.

- Imports Quantity : 156,947 units
  Weight : 33,433 kg
  Value : 607,793 US$

Exporting Countries : Japan, Belgium, Austria

- Exports Quantity : 198,572 units
  Weight : 151,402 kg
  Value : 1,593,692 US$
  Importing Countries : Hong Kong, Taiwan, Philippines, Sri Lanka

(2) Gas Meters

According to the gas statistics, the number of users decreased between 1989 and 1991.

1989	:	24,988
1990	:	22,925
1991	:	16,955

While the exact reason for the above decline is unknown, it can be said that the use of gas is as yet far from popular. 95% of the gas users in 1991 were household users as shown in Table 2-24 and most users are assumed to live in large cities, particularly Jakarta. As there is no domestic manufacturer of gas meters, all gas meters are imported. The technical difficulty of manufacturing gas meters which demand high quality and safety standards than watt-hour meters is the main reason for the lack of domestic manufacturers.

(3) Water Meters

The number of customers, i.e. number of water meters installed, by region/ province in 1991 is given in Table 2-25. The total number of customers was approximately 2.3 million in 1990 with 5.14 million households, some 13% of Indonesia's total households, receiving the supply of drinking water.

(4) Taxi Meters

Most taxi meters are imported from Taiwan although some domestically manufactured taxi meters are in use. The import volume declined in the recent 3 years as the number of registered taxis little changed (Table 2-26). The demand for taxi meters is expected to increase in the future as more regional governments are introducing taxis equipped with meters.

Table 2-1 First Class Autonomous Bodies 27 Provinces and Territories Capital City

	Provincel Territory		Capital City
1.	Dacrah Iatimewa Ache (DAERAH ISTIMEWA)		BANDA ACHE
2.	Sumatera Utara	*	MEDAN
3.	Sumatera Barat		DADANG
4.	Riau		PAKAN BARU
5.	Sumatera Selatan	*	PALEMBANG
6.	Jambi		JANBI
7.	Bengkulu		BENGUKULU
8.	Lampung		TANJUNG KARANG
9.	Jawa Barat		GANDUNG
10.	DKI Jakarta (DAERAN KHUSUS IBUKOTA)	*	JAKARTA
11.	DI Yogyakarta (DAERAH ISTIHENA)	*	JOGYAKARTA
12.	Jawa Tengah	*	SEMARANG
13.	Jawa Timur		SURABAYA
14.	Kalimantan Barat		PONTIANAK
15.	Kalimantan Tengah		PALANGKA PAYA
16.	Kalimantan Selatan		BANJARMASIN
17.	Kalimantan Timur		SANARIUDA
18.	Sulawesi Utara		MENADO
19.	Sulawesi Tengah		PALU
20.	Sulawesi Tenggara		KENDARI
21.	Sulawesi Selatan		UJUNG PANDANG
22.	Nusa Tenggara Barat		MATARAN
23.	Nusa Tenggara Timur		KUPANG
24.	Maluku	*	AMBON
25.	Bali	*	DENPASAR
26.	Irian Jaya		JAYAPURA
27.	Timor Timur		DILLY

Note: Including persons with o permanent residence

Table 2-2 Goal of Repelita VI (Population)

Item	Unit	Estimated Values Repelita V Final Year	Repelita VI	
		1993/94	1994/95	1998/99
Population				
Indonesia	millions	189.1 (100%)	192.2 (100%)	204.4 (100%)
Jawa	millions	111.9 (59.2%)	113.4 (59.0%)	118.9 (58.2%)
Outside Jawa	millions	77.2 (40.8%)	78.8 (41.0%)	85.5 (41.8%)
Urban	millions	64.3 (34.0%)	67.4 (35.1%)	80.3 (39.2%)
Rural	millions	124.8 (66.0%)	124.8 (64.9%)	124.1 (60.8%)
Birth Rate	per 1,000 persons	24.5	24.1	22.6
Death Rate	per 1,000 persons	7.9	7.8	7.5
Population Growth Rate	per 1,000 persons	1.7	1.6	1.5

* Calendar Year (Jan.~Dec.)
Source: BAPPENAS, 'Rencana Pembangunan Jangka Panjang Tahun Ke II dan Pembangunan Lima Tahun Ke VI'

Table 2-3 Number and Growth Rate Population by Province

Province	Population			Population Growth Rate	
	1971	1980	1990	1971-1981	1980-1990
1. Dacrah Iatimewa Aceh	2,009	2,611	3,416	2.93	2.72
2. Sumatera Utara	6,622	8,361	10,256	2.60	2.06
3. Sumatera Barat	2,793	3,407	4,000	2.21	1.62
4. Riau	1,642	2,169	3,304	3.11	4.30
5. Jambi	1,006	1,446	2,021	4.07	3.40
6. Sumatera Selatan	3,441	4,630	6,313	3.32	3.15
7. Bengkulu	519	768	1,179	4.39	4.38
8. Lampung	2,777	4,625	6,018	5.77	2.67
9. DKI Jakarta	4,579	6,503	8,259	3.93	2.42
10. Jawa Barat	21,624	27,453	35,384	2.66	2.57
11. Jawa Tengah	21,877	25,373	28,521	1.64	1.18
12. DI Yogyakarta	2,489	2,751	2,913	1.10	0.57
13. Jawa Timur	25,517	29,189	32,504	1.49	1.08
14. Bali	2,120	2,470	2,778	1.69	1.18
15. Nusa Tenggara Barat	2,203	2,725	3,370	2.36	2.15
16. Nusa Tenggar Timur	2,295	2,737	3,269	1.95	1.79
17. Timor Timur	-	555	748	-	3.02
18. Kalimantan Barat	2,020	2,486	3,229	2.31	2.65
19. Kalimantan Tengah	702	954	1,396	3.43	3.88
20. Kalimantan Selatan	1,699	2,065	2,598	2.16	2.32
21. Kalimantan Timur	734	1,218	1,877	5.73	4.42
22. Sulawesi Utara	1,718	2,115	2,478	2.31	1.60
23. Sulawesi Tengah	914	1,290	1,711	3.86	2.87
24. Sulawesi Tenggara	5,181	6,062	6,982	1.74	1.42
25. Sulawesi Tenggara	714	942	1,350	3.09	3.66
26. Maluku	1,090	1,411	1,856	2.88	2.78
27. Irian Jaya	923	1,174	1,649	2.67	3.46
INDONESIA	119,208	147,490	179,379	2.32	1.98

Note: Including persons with no permament residence.
Source: STATISTIK 1992

Table 2-4 Outline: Goals and Reality of Repelita and PJP III

No.	Item	Unit	Estimeted Values Reprlita V Flnal Year 1993/94	Final Goals of PJP II				
				VI	VII	VIII	IX	X
1	2	3	4	5	6	7	8	9
I	Population							
	1. Total	million people	189.1	204.4	219.4	233.6	246.5	258.1
	a. Male	million people	94.3	101.9	109.5	116.5	122.9	218.7
	b. Female	million people	94.8	102.5	109.9	117.1	123.6	129.4
	2. Growth Rate	%	1.66	1.51	1.37	1.20	1.01	0.88
	3. Birth Rate	per 1,000 people	24.5	22.6	20.9	19.0	17.2	16.1
	4. Death Rate	per 1,000 people	7.9	7.5	7.2	7.1	7.1	7.4
II	Labour Force							
	1. Job Applicants	million people	78.8	91.4	105.2	119.7	133.9	147.9
	2. Persons who found employment	million people	78.8	90.7	103.8	117.8	132.6	148.0
III	Social Indicaotors							
	1. Infant Mortaliry Rate	per 1,000 births	58	50	43	37	31	26
	2. Average Life	age	623.7	64.6	66.3	67.8	69.3	70.6
	3. Fertility Rate	per 100,000 births	425	225	189	143	108	80
	4. School Attendance Rate							
	a. Primary School	%	109.9	114.9	117.0	118.0	118.0	117.0
	b. Middle School	%	52.7	66.2	87.0	108.0	114.0	118.0
	c. High School	%	33.2	40.5	51.0	60.0	71.0	80.0
	d. University	%	10.5	12.8	15.0	19.0	21.0	25.0

Source: BAPPENAS, 'Rencana Pembangunan Jangka Panjang Tahun Ke II dan Pembangunan Lima Tahun Ke VI'

Table 2-5 Indonesia's Main Economic Indicators

(Unit: US$100m)

	Population (millions)	GDP Growth Rate (%)	GDP per Capita	Exports (Non-oil)	Imports	Economic Revenues and Expenditure	Foreign Debt	D.S.R. %
1983	158	3.4	494	211 (50)	164	-42	300	20.1
1984	162	6.0	505	219 (59)	139	-20	319	21.3
1985	165	2.3	512	186 (59)	103	-18	367	29.5
1986	168	3.9	459	148 (65)	107	-40	431	35.9
1987	172	3.6	424	171 (86)	124	-17	525	38.5
1988	176	5.7	450	192 (115)	133	-19	528	42.7
1989	179	7.4	530	229 (140)	163	-13	546	35.2
1990	183	7.4	598	168 (149)	215	-32	679	21.1
1991	188	6.6	607	294 (180)	246	-42	725	33.0
1992	-	6.1	NA	399 (233)	270	-33	800*	-

Population: REPELITA V Goal 1.9% Growth (192.9 million by 1993)
GDP Growth: REPELITA V Goal Approx. 5.0% (Yearly Average)
Current Balance/DSR: REPELITA V Goal 25% (1993)

Source: Bank of Indonesia, Financial Statistics Economic Indicators, World Bank,
World Bank: World Debt Tables 1992/93

Table 2-6 Republic of Indonesia

	1992	1993	1994
GDP Growth Rate (%)	6.3	6.5	7.1
Inflation Rate (%)	6.8	8.9	9.7

Source: Indonesian Statistics, 1992 figures are actual, 1993 and 1994 figures are projected.

Table 2-7 FY 1993/94 National Budget (Annual revenue), first half results, second half forecasts

(Unit: Million rupiah)

	1993/94 Planned	First Half Results	Second Half Forecasts	1993/94 Total	Compared to Plan
Oil • Gas	15,127,600	7,018,590	7,000,000	14,018,590	-1,109,010
Non-oil • Gas	37,641,400	16,060,741	23,300,000	39,360,741	1,719,341
Development	9,553,100	4,145,486	5,900,000	10,045,486	492,386
Total Revenues	62,322,100	27,224,817	36,200,000	63,424,817	1,102,717

Source: Ministry of Finance

Table 2-8 Foreign Currency Reserves

		(M1) Money Supply (BioRP)	Foreign Currency Reserves (Held by Central Bank)
1980	Dec	4,995	(Mio US$)
1981	Dec	6,486	
1982	Dec	7,121	4,154
1983	Dec	7,569	4,808
1984	Dec	8,581	5,751
1985	Dec	10,104	5,846
1986	Dec	11,677	5,302
1987	Dec	12,685	6,512
1988	Dec	14,392	6,191
1989	Dec	20,114	6,562
1990	Dec	23,819	8,661
1991	Oct	25,162	9,348
	Nov	25,831	10,010
	Dec	26,342	9,868
1992	Jan	26,231	10,190
	Feb	26,253	10,094
	Mar	27,318	10,542
	Apr	26,107	11,128
	Mar	26,145	11,315
	Jun	26,844	11,352
	Jul	27,001	11,620
	Aug	27,417	11,870
	Sep	27,626	11,582
	Oct	27,880	11,788
	Nov	28,508	12,172
	Dec	28,779	11,611
1993	Jan	26,739	11,773
	Feb	29,051	11,832
	Mar	30,592	11,961
	Apr	29,281	12,205
	Mar	29,288	12,100
	Jun		
	Jul		

Source: Central Bank

Table 2-9 Gross Domestic Product (Ratios) / Composition by Industry Sector

No.	Industry Sector	Estimated Values Repelita V Final Year 1993/94	1998/99
1.	Agriculture	20.2	17.6
2.	Mining	12.1	10.1
3.	Industry	20.8	24.1
	a. Non-oil • Gas	17.6	21.3
	b. Oil • Gas	3.2	2.8
4.	Construction	6.4	7.0
5.	Commerce	17.1	17.5
6.	Transport and Communications	5.9	6.4
7.	Others	17.5	17.4
	GDP	100.0	100.0
	GDP Arising form Oil • Gas	12.6	9.8
	GDP Arising form Non-oil • Gas	87.4	90.2

1989/90 Fixed Prices

Source: BAPPENAS, 'Rencana Pembangunan Jangka Panjang Tahun Ke II dan Pembangunan Lima Tahun Ke VI'

Table 2-10 Progress of Intenational Balance of Payments

(US$M)

Year	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Balance of Current Account	-1,599	-3,741	-4,352	-2,564	-2,824	-3,190
Balance of Trade	6,456	5,115	4,911	7,986	8,169	8,822
Exports	23,830	28,143	29,714	35,303	38,052	42,789
Oil- • Gas	9,337	12,763	10,706	10,480	9,172	9,200
Non-oil • Gas	14,493	15,380	19,008	24,823	28,880	33,589
Imports	17,374	23,028	24,803	27,317	29,883	33,967
Balance of Services	-8,055	-8,856	-9,263	-10,547	-10,993	-12,012
Balance of Capital Account	22,405	6,780	5,551	5,199	5,003	4,311
Foreign Debt	5,516	5,006	5,600	5,755	6,040	5,713
Foreign Loan Repayments	-3,686	-4,082	-4,182	-4,840	-5,171	-4,973
Others	575	5,856	4,133	4,284	4,134	3,571
Errors and omissions	-558	263	-218	-1,199	1,673	0
Overall Balance of Payments	248	3,302	981	1,439	506	1,121

Note: 1993/94: Expected values, 1994/95: Planned values (Nominal Calculations using crude oil price of $16.00/barrel)
Source: President Suharto's Parliamentary Speech (January 6) and Speech of Derector General of Central Bank (January 14)

Table 2-11 Progress in Indonesia's Trade Value

(US$100m)

Year	1988	1989	1990	1991	1992	1993
Exports	192.2	221.6	256.8	291.4	339.7	-
Growth (%)	12.2	15.3	15.9	13.5	16.6	-
Non-oil • Gas	115.4	134.8	146.0	182.5	233.0	-
Growth (%)	34.5	16.8	8.3	24.9	27.7	-
Imports	132.5	163.6	218.4	258.7	272.8	-
Growth (%)	7.1	23.5	33.5	18.5	5.5	-

Source: Economic Indicators/Central Bureau of Statistics, others

Table 2-12 Conditions for Promotion of Regional Industries and Direction to Development Viewed by Region

Type	Province	Direction of Development	Major Problems	Necessary incentives and base for promotion
A Jawa Density Populated Trpe	Jakarta Jawa Barat Jawa Tengah DI Yogyakarta Jawa Timur Bali	• Further development of manufacturing industries and diversification of industry types • Development of labour-intensive industries	• Absorption of the labour force	<Private sector base> • Promotion of liberalisation • Improvement of investment environment
B Sumatra Large-scale Agriculture Type	Sumatera Utara Lampung Sumatera Barat Sulawesi Utara Nusa Tenggara Barat Kalimantan Selatan Sulawesi Selatan	• Development of agricultural products processing industries (Primary products, food processing, others) • Development of forestry-related industries	• Securing of market competitiveness and high added value • Diversification of industrial fields • Consideration towards protection of resources	<Private sector base> • Activisation of private sector businesses • Improvemt of the investment environment
C Sumatra Oil Development Type	Ache Riau Sumatera Selatan Kalimantan Timur	• Further development of resource deveopment industries (oil, natural gas, mining development) • Fostering of subsidiary industries.	• Organic connections between large-scale projects and local industries	<Government + private sector businesses> • Improvement of the investment (especially subsidiary industries)
D Sulawesi, Nusa and Tengala Subsistence Agriculture Type	Bengkulu Jambi Sulawesi Tenggara Nusa Tenggara Timur Timor Timur	• Promotion of local industries (especially those products which make use of local materials)	• Opening up of new industrial fields • Improvement of social welfare and purchasing power	<Government + private sector businesses> • Infrastructure precedence from the government
E Kalimantan, Irian Jaya Undeveloped Type	Maluku Kalimantan Barat Sulawesi Selatan Kalimantan Tengah Irian Jaya	• Development of resource development industries (Especially forestry and timber, fisheries, mining development)	• Consideration towards protecting resources • Organic connections between large-scale projects and local industries	<Government + private sector businesses> • Infrastructure precedence from the govemtment

Source: Asian Economic Research Institute

Table 2-13

No.	Item	Unit	Estimated values Repelita V Final Year 1993/94	Repelita VI	
				1994/95	1998/99
1	2	3	4	5	6
C					
1	Total Investment	Rp trilyun	93.4	102.1	660.1 ***)
	Private	Rp trilyun	68.2	74.7	484.2 ***)
	Government	Rp trilyun	25.2	27.4	175.9 ***)
2	Raisig of funds	Rp trilyun	93.4	102.1	660.1 ***)
	a. Domestic	Rp trilyun	87.5	95.2	622.8 ***)
	Private	Rp trilyun	64.5	67.3	453.4 ***)
	Government (Gross)	Rp trilyun	26.0	27.9	169.4 ***)
	b. Foreign Funds (Net)	Rp trilyun	5.9	6.9	37.3 ***)

Source: BAPPENAS,'Rencana Pembangunan Jangka Panjang Tahun Ke II dan Pembangunan Lima Tahun Ke VI'

Table 2-14

NO.	Item	Unit	Expected Ualue Repelita V Final Year	Repelita VI	
			1993/94	1994/95	1994/95 s/d 1998/99
1	2	3	4	5	6
VI	National Finance	Rp. milyar			
1	Total Revenues	Rp. milyar	52,769.0	59,737.1	382,048.6
2	Revenues from Non-oil • Gas	Rp. milyar	37,641.4	46,885.9	310,861.5
3	Tax Revenues	%	33,848.7	40,074.4	278,657.4
4	Growth in Tax Revenues	%	16.2	18.4	17.3
5	Tax Revenues as a Percentage of National Finances	%	64.5	71.3	77.8 **)
6	Percentage of Tax Revenues Relating to Non-oil • Gas	%	12.5	13.1	15.6 **)
7	Percentage of Current Expenditure Accounted for by Debt Repayments	%	45.1	42.4	32.8 **)
8	Percentage of Development Revenues Accounted for Government Saving		62.1	63.5	67.7 **)
VII					
1	Non-oil • Gas Exports	US$ juta	28.880	33.589	62.784 **)
2	Exports of Manufactures	US$ juta	24.764	29.109	56.150
3	Growth in Non-oil • Gas Exports	%	16.3	16.3	16.8 *)
4	Growth in Exports of Manufactures	%	17.8	17.5	17.8
5	Percentage of Total Value of Exports Accounted for by Non-oil • Gas Exports	%	75.9	78.5	87.0 **)

Source: BAPPENAS, 'Rencana Pembangunan Jangka Panjang
Tahun Ke II dan Pemabngunan Lima Tahun Ke VI'

No.	Item	Unit	Estimated Values Repelita V Final Year	Repelita V	
			1993/94	1994/95	1994/95 s/d 1998/99
1	2	3	4	5	6
6	Non-oil • gas exports as a percentage of GDP	%	19.9	21.4	25.6 *)
7	Current expenditure deficit as a percentage of GDP	%	1.9	2.0	1.3 **)
8	Foreign currency reserves	bln impor	5.1	4.8	5.3 *)
9	Debt service ratio	%	32.5	30.4	20.2 **)
	a. Government	%	21.1	19.0	20.2 **)
	b. Private	%	11.4	11.4	1.3 **)
VII	National foreign debt	US$			
1	Debt outstanding	milyar	83.2	84.3	95.8 **)
2	Debt outstanding as a percentage of GDP	%	57.2	53.7	45.9 **)

Source: BAPPENAS, 'Rencana Pembangunan Jangka Panjang Tahun Ke II dan Pembangunan Lima Tahun Ke VI'

Table 2-15

No.	Item	Unit	Estimated Values	PJP II				
			Repelita V Final Year 1993/94	VI 1994-1998	VII 1999-2003	VIII 2004-2008	IX 2009-2013	X 2014-2018
1	2	3	4	5	6	7	8	9
	GDP							
	a. GDP Growth Rate	% per tahun	6.6	6.2	6.6	7.1	7.8	8.7
	(1) Agriculture	% per tahun	2.4	3.4	3.5	3.5	3.5	3.5
	(2) a. Oil • Gas	% per tahun	10.0	9.4	9.4	9.4	9.1	8.7
	b. Non-oil • Gas	% per tahun	11.0	10.3	10.2	10.0	9.5	9.0
	(3) Others	% per tahun	7.2	6.0	6.3	6.8	8.0	9.5
	b. GDP per Capita	1000 rupiah	1.188	1.487	1.908	2.525	3.483	5.046
	(1989/90 prices)	US$	676	775	995	1.317	1.816	2.631
	c. Composition of Production							
	(1) Agriculture	%	20.2	17.6	15.2	12.8	10.5	8.2
	(2) a. Oil • Gas	%	20.8	24.1	27.4	30.5	32.4	32.5
	b. Non-oil • Gas	%	17.6	21.3	25.1	28.7	31.0	31.5
	(3) Others	%	59.0	58.3	57.4	56.7	57.1	59.4

Source: BAPPENAS, 'Rencana Pembangunan Jangka Panjang Tahun Ke II dan Pembangunan Lima Tahun Ke VI'

Table 2-16 Real Growth Rate, GDP Share and Employment Share of Commerce Sector

(Unit:%)

	1987	1988	1989	1990	1991	1992
Real Growth Rate	7.1	9.1	10.7	7.1	5.4	7.4
GDP Share	15.2	15.7	16.1	16.1	15.9	16.1
Employment Share	-	15.3	14.6	14.6	15.0	15.0

Source: Statistical Yearbook of Indonesia

Table 2-17 Target Growth Rate for Commerce/Transport Sector by Region/Province

(Unit: %)

Region / Province	Target Growth Rate 1994-1999	Share in GRDP	
		1993	1998
1. Aceh	7.5	9.7	12.9
2. Sumatera Utara (North)	10.4	23.9	26.2
3. Sumatera Barat (West)	7.3	31.0	32.1
4. Riau	6.4	10.0	12.0
5. Jambi	8.6	28.1	29.8
6. Sumatera Seletan (South)	7.5	25.0	25.8
7. Bengkulu	9.1	23.5	25.4
8. Lampung	10.0	22.3	25.0
9. Jakarta	6.9	27.7	26.3
10. Java Barat	5.7	24.1	24.2
11. Java Tengah (Central)	6.8	21.9	22.1
12. Yogyakarta	6.7	25.7	27.5
13. Java Timur (East)	6.0	26.6	26.4
14. Kalimantan Barat	10.2	29.0	31.2
15. Kalimantan Tengah	8.2	27.4	28.8
16. Kalimantan Selatan	8.6	30.9	32.3
17. Kalimantan Timur	7.9	16.3	18.9
18. Sulawesi Utara	7.7	24.9	26.9
19. Sulawesi Tengah	6.7	21.2	22.2
20. Sulawesi Selatan	8.5	26.3	28.5
21. Sulawesi Timur Selatan	7.3	18.8	19.5
22. Bali	7.1	31.5	33.1
23. Nusa Tenggara Barat	7.9	23.7	25.9
24. Nusa Tenggara Timur	6.7	21.3	22.9
25. Maluku	9.5	23.7	25.0
26. Irian Jaya	8.2	11.0	11.4
27. Timor Timur	6.9	17.8	17.8
National Average	6.6	17.1	17.5

Note : Figures are combined for the commerce and transport sectors.
Source : BAPPENAS, "Rencana Pembangunan Jangka Panjang Tahum De II dan Pembangunan Lima Tahun Ke VI"

Table 2-18 Target Growth Rate for Industry (Non-Oil, Non-Gas) by Region/Province

(Unit: %)

Region / Province	Target Growth Rate 1994-1999	Share in GRDP	
		1993	1998
1. Aceh	10.9	5.1	7.9
2. Sumatera Utara (North)	11.8	20.0	23.3
3. Sumatera Barat (West)	9.8	13.3	15.5
4. Riau	14.0	2.1	3.6
5. Jambi	11.7	19.3	23.5
6. Sumatera Seletan (South)	9.4	16.9	19.0
7. Bengkulu	10.1	3.1	3.5
8. Lampung	11.8	12.6	15.3
9. Jakarta	11.0	28.0	32.2
10. Java Barat	9.2	23.1	27.2
11. Java Tengah (Central)	12.5	17.0	22.4
12. Yogyakarta	8.3	11.4	13.2
13. Java Timur (East)	9.6	22.9	26.8
14. Kalimantan Barat	11.3	20.6	23.2
15. Kalimantan Tengah	11.2	11.2	13.5
16. Kalimantan Selatan	10.4	18.7	21.2
17. Kalimantan Timur	10.7	10.3	13.5
18. Sulawesi Utara	9.9	6.3	7.6
19. Sulawesi Tengah	9.4	6.2	7.3
20. Sulawesi Selatan	10.9	7.8	9.4
21. Sulawesi Timur Selatan	9.3	2.3	2.6
22. Bali	10.,5	6.0	7.3
23. Nusa Tenggara Barat	9.1	3.3	3.8
24. Nusa Tenggara Timur	9.1	2.2	2.6
25. Maluku	12.9	14.4	17.7
26. Irian Jaya	12.8	2.2	2.8
27. Timor Timur	9.2	1.8	2.1
National Average	10.3	17.6	21.3

Source: BAPPENAS, "Rencana Pembangunan Jangka Panjang Tahum De II dan Pembangunan Lima Tahun Ke VI"

Table 2-19 Real Growth Rate, GDP Share and Employment Share of Manufacturing Sector

(Unit: %)

	1987	1988	1989	1990	1991	1992
Real Growth Rate	10.6	12.0	9.2	12.5	9.6	9.7
GDP Share	17.2	18.2	18.5	19.4	19.9	20.5
Employment Share	-	8.1	8.8	10.1	10.4	10.5
Export Share	38.9	48.2	49.8	46.2	51.7	57.7

Source: Statistical Yearbook of Indonesia

Table 2-20 Production Trends of Main Manufacturing Products

Fiscal Year Ending March 31	1989	1990	1991	1992	1993*
Textiles (million meters)	3,503	4,494	5,028	5,342	5,564
Yarn (1,000 bales)	2,712	3,405	3,573	4,140	4,474
Leather (1,000 tons)	21	26	28	29	31
Fertiliser (TSP + ZA) (1,000 tons)	1,752	1,888	1,881	1,687	1,460
Fertiliser					
Urea (1,000 tons)	4,246	4,892	5,131	4,881	4,946
Ammonia (1,000 tons)	357	369	303	332	340
Cement (1,000 tons)	13,343	14,201	15,890	16,255	17,902
Automobile Tyres (1,000 units)	6,396	7,377	8,220	8,209	8,772
Motorcycle Tyres (1,000 units)	4,870	5,490	5,890	7,682	7,923
Coconut Oil (1,000 tons)	448	486	490	540	553
Refined Palm and Coconut Oil (1,000 tons)	728	847	969	981	1,398
Margarine (1,000 tons)	34	38	44	50	59
Cigarettes (million units)	17.6+	30.3	34.8	52.8	63.6
Clove Cigarettes (million units)	124.2	130.4	139.3	125	135.9
Detergent (1,000 tons)	175	193	213	234	257
Crumb Rubber (1,000 tons)	961	1,027	1,037	1,079	1,079
PVC Pipes (1,000 tons)	60	62	75	90	99
Paint (1,000 tons)	73	80	116	154	162
Plywood (1,000 m^3)	6,900	7,700	8,400	8,500	9,000
Sawn Wood (1,000 m^3)	10,300	10,900	11,100	10,500	10,000
Wire Steel (1,000 tons)	131	143	156	171	-
Sponge Iron (1,000 tons)	985	1,210	1,357	1,355	1,320
Concrete Iron and Steel (1,000 tons)	944	1,300	1,325	1,192	1,300
Steel Slabs (1,000 tons)	722	800	904	963	1,007
Diesel Engines (1,000 units)	32,424	44,345	49,660	51,800	54,000
Tractors (units)	202	65	220	436	396
Hand Tractors (units)	2,490	5,533	6,330	10,000	9,350
Forklifts (units)	513	425	1,248	803	675
Automobiles (1,000 units)	167	175	271	261	196
Motorcycles (1,000 units)	260	281	410	436	457
Televisions (1,000 units)	522	797	1,082	1,581	1,797
Radios/Cassette Players (1,000 units)	1,536	2,339	3,092	3,788	5,018
Refrigerators (1,000 units)	104	138	159	213	230
Dry Batteries (million units)	1,017	1,077	1,158	1,224	1,442

* Through December, 1992
Source: Central Bureau of Statistics

Table 2-21 Production and Trade Volumes of Measuring Instruments

Instrument	Year	Production Volume (A)	Import Volume (B)	Domestic Demand (A)+(B)	Number of Domestic Manufacturers	Main Sources of Supply
Balance	1990	287,146	4,480	291,626	176	1. Japan
	1991	260,192	4,636	264,828		2. Taiwan
	1992	299,659	5,577	305,236		3. Germany
Weight	1990	937,705	0	937,705	40	
	1991	860,437	0	860,437		
	1992	954,197	0	954,197		
Graduated Scale	1990	32,424	0	32,424	9	
	1991	20,779	0	20,779		
	1992	23,216	0	23,216		
Tape Measure	1990	0	65	65		1. Japan
	1991	0	76	76		2. England
	1992	0	105	105		
Dry Can	1990	243,419	0	243,419	38	
	1991	226,115	0	226,115		
	1992	272,860	0	272,860		
Wet Can	1990	618,256	0	618,256	38	
	1991	510,574	0	510,574		
	1992	608,894	0	608,894		
Tank Lorry	1990	1,580	0	1,580	63	
	1991	2,358	0	2,358		
	1992	2,268	0	2,268		
Water Meter	1990	155,143	61,907	217,050	4	1. South Korea
	1991	197,778	65,505	263,283		2. France
	1992	193,584	55,622	249,206		3. Taiwan
Taxi Meter	1990	0	6,648	6,648	5	1. Taiwan
	1991	5	3,808	3,814		
	1992	21	2,184	2,205		
Gasoline Meter	1990	0	923	923	1	1. Japan
	1991	0	857	857		2. US
	1992	0	989	989		3. England
Watt-Hour Meter	1990	1,200,000	na	na	5	
	1991	1,200,000	na	na		
	1992	1,200,000	na	na		
Gas Meter	1990	0	8	8		1. US
	1991	0	227	227		2. France
	1992	0	27	27		
Storage Tank	1990	380	0	380	21	
	1991	96	0	96		
	1992	147	0	147		
Standard Volume	1990	90	2	92	6	1. USA
	1991	60	7	67		
	1992	162	6	168		

Source: Directorate of Metrology, Ministry of Trade

Table 2-22 Estimated Number of Watthour Meters Required in Indonesia (from PLN's Report in December, 1992)

February 20, 1993 by Melbelosa

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total Population	(in units of 1,000)	179,322	182,615	186,352	189,917	193,459	196,990	200,492	204,023	207,538	211,048	214,528
Electrification Rate	(%)	29.9	31.9	36.4	40.0	43.8	47.9	52.1	56.6	61.3	66.0	70.8
① Domestic Customers	(in units of 1,000)	10,723	11,651	13,566	15,193	16,947	18,872	20,891	23,095	25,444	27,858	30,377
② Commercial Customers	(in units of 1,000)	407	439	533	589	647	709	774	943	915	968	1,061
③ Public Customers	(in units of 1,000)	281	306	358	401	446	496	548	604	664	725	787
④ Industrial Customers	(in units of 1,000)	30	37	47	55	51	67	78	88	98	109	120
Total Number of Customers	(in units of 1,000)	11,441	12,432	14,505	16,238	18,092	20,143	22,292	24,731	27,122	29,660	32,345

Number of Customers and Increase of Watthour Meters Converted from Above Table

Single-Phase Meter Customers (in units of 1,000)	10,930	11,874	13,834	15,490	17,275	19,233	21,288	23,560	25,918	28,366	30,932
Yearly Increase of Single-Phase Meters (in units of 1,000)		944	1,960	1,656	1,785	1,958	2,055	2,271	2,358	2,448	2,566
Three-Phase Meter Customers (in units of 1,000)	512	558	671	748	817	910	1,004	1,171	1,204	1,294	1,414
Yearly Increase of Three-Phase Meters (in units of 1,000)		47	113	76	69	93	94	167	32	90	120

① Total population ÷ 5 x electrification rate. All the customers given in ① are single-phase meter customers. 30% of ② plus ③ single-phase meter customers. 70% of ② plus ③ are three-phase meter customers. All the customers shown in ④ are three-phase meter customers.

Source: Interim Report

Table 2-23 Number of Electricity Customers by Type of Customers

Province / PLN Operational Unit	Residential	Industrial	Commercial	Domestic	Govt. Office Buildings	Public Street Lighting	Total	%
Region I (ID Ache)	177,008	531	16,142	5,874	1,953	129	201,637	1.63
Region II (North Sumatera)	726,595	2,825	25,350	12,251	3,811	386	771,318	5.22
Region III	388,025	787	23,051	10,018	3,578	346	425,316	3.43
- West Sumatera	252,238	414	9,282	7,254	2,179	289	271,660	2.19
- Riau	135,787	359	13,779	2,764	1,399	57	154,155	1.24
Region IV	532,371	1,153	28,359	10,033	4,476	280	576,687	4.65
- South Sumatera	278,378	496	13,018	4,557	1,953	151	293,563	2.41
- Jambi	64,650	253	5,017	1,282	742	29	71,953	0.58
- Lampung	121,686	292	7,681	2,630	1,017	57	133,263	1.07
- Bengkulu	67,657	107	2,753	1,589	784	33	72,903	0.59
Region V (West Kalimantan)	133,383	403	14,350	2,924	1,647	91	152,798	1.23
Region VI	386,555	1,080	19,587	9,545	4,269	665	421,701	3.40
- Central Kalimantan	52,457	221	4,059	1,503	1,093	65	59,409	0.48
- South Kalimantan	196,185	808	6,885	5,802	1,809	188	211,157	1.70
- East Kalimantan	137,913	351	8,653	2,440	1,367	411	151,135	1.22
Region VII	293,403	594	10,255	5,708	2,705	290	313,985	2.54
- North Sulawesi	219,135	377	6,004	5,182	1,722	245	232,555	1.55
- Central Sulawesi	74,268	217	4,281	1,526	983	44	81,299	0.66
Region VIII	517,998	1,057	17,252	7,443	4,119	219	548,108	4.42
- South Sulawesi	470,807	954	14,942	5,525	3,332	198	496,866	4.01
- Southeast Sulawesi	47,091	103	2,320	818	787	23	51,242	0.41
Region IX (Maluku)	98,091	181	4,344	2,219	1,196	87	104,118	0.84
Region X (Irian Jaya)	54,541	158	5,994	1,963	1,719	191	64,888	0.52
Region XI	534,274	1,861	20,728	14,481	5,000	609	878,953	4.86
- Bali	291,165	1,335	12,247	8,251	1,651	359	315,008	2.54
- West Nusa Tenggara	157,482	250	4,468	4,094	1,293	153	166,740	1.35
- East Nusa Tenggara	71,320	247	3,543	1,557	1,309	44	78,235	0.63
- East Timor	14,307	29	1,385	489	747	53	15,970	0.14
Outside Java	3,840,444	10,840	185,452	83,484	34,473	3,293	4,157,755	33.54
Dist. of East Java	2,054,714	5,952	52,921	41,282	8,557	1,598	2,175,034	17.55
Dist. of Central Java	2,011,998	4,158	60,199	47,608	11,842	2,087	2,137,892	17.25
Central Java	1,730,823	3,587	52,701	41,013	10,309	1,733	1,840,156	14.84
DI Yogyakarta	281,175	571	7,498	8,595	1,533	354	297,725	2.40
Dist. of West Java	2,226,925	7,282	56,855	40,554	7,472	905	2,339,993	18.88
Dist. of Jaya and Tanggerang	1,472,878	8,089	82,185	18,947	3,488	434	1,685,031	12.79
Java	7,775,515	25,501	252,160	148,391	31,359	5,024	8,238,950	66.46
Indonesia	11,515,959	36,141	437,612	231,855	65,832	8,317	12,395,715	100.00
(%)	93.71	0.29	3.53	1.87	0.53	0.07	100.00	

Source: PLN Statistics 1991/92

Table 2-24 Quantity and Value of Gas Production and Gas Users (1991)

	Number of Gas Users	Production Quantity (10^3m^3)	Production Value (10^3Rp)
A. Production	-	514,347	106,414,732
B. Consumption	16,955	500,829	122,429,323
- Household	16,132	14,426	3,350,486
- Industry	248	479,714	117,459,721
- Hotels	66	787	181,309
- Supermarkets	52	289	94,901
- Hospitals	75	1,793	446,831
- Offices	86	567	136,510
- Others	296	3,253	759,565
C. Losses	-	13,518	-

Source: BPS, "Electricity and Gas Statistics 1991"

Table 2-25 Number of Water Supply Customers by Province in 1991

Province	Households	Tourism Objects and Hotels	Hospitals and Social Institutions	Places of Worship	Public	Industrial Estates	Government	Others	Total
1. DI. Aceh	28,026	133	184	198	43	2,841	787	37	32,249
2. Sumatera Utara	173,769	4,214	1,234	886	732	19,747	2,464	96	203,142
3. Sumatera Barat	54,671	304	599	683	494	3,041	820	672	61,284
4. Riau	23,403	220	341	211	36	4,956	816	135	30,118
5. Jambi	22,472	80	180	367	67	2,563	224	3	25,956
6. Sumatera Selatan	74,728	578	822	213	373	6,080	682	37	83,513
7. Bengkulu	13,254	41	74	141	78	334	337	-	14,259
8. Lampung	26,939	30	163	219	484	1,888	274	333	30,330
9. DKI Jakarta									
10. Jawa Barat	525,473	6,659	5,489	3,669	4,108	37,238	4,170	533	587,339
11. Jawa Tengah	209,610	414	1,865	1,647	4,758	16,507	3,319	1,297	239,417
12. DI. Yogyakarta	29,361	19	28	400	334	1,309	880	-	32,417
13. Jawa Timur	339,179	13,189	7,144	2,381	4,065	13,073	4,717	770	384,519
14. Bali	53,443	368	585	300	1,204	5,909	1,361	7	63,177
15. Nusa Tenggara Barat	25,601	27	340	178	718	1,040	456	3	28,363
16. Nusa Tanggara Timur	22,539	105	486	166	352	1,972	622	277	26,519
17. Timor Timor	3,759	4	16	19	82	396	183	16	4,475
18. Kalimantan Barat	78,039	1,398	372	513	568	15,422	1,513	19	97,844
19. Kalimantan Tengah	16,810	59	69	102	143	421	418	6	18,028
20. Kalimantan Selatan	55,992	537	684	456	756	1,895	740	250	61,310
21. Kalimantan Timur	49,218	181	248	407	532	3,255	413	28	54,282
22. Sulawesi Utara	63,128	94	754	557	797	3,431	1,676	232	70,669
23. Sulawesi Tengah	16,677	16	143	83	337	1,238	188	14	18,696
24. Sulawesi Selatan	74,982	585	351	449	2,163	4,860	1,037	283	84,710
25. Sulawesi Tenggara	12,998	66	50	95	67	576	345	3	14,200
26. Malaku	14,198	45	12	104	193	1,122	551	9	16,234
27. Irian Jaya	21,145	69	116	175	91	901	532	41	23,070
Indonesia	2,029,414	29,435	22,349	14,619	23,576	152,015	29,525	5,101	2,306,034

Source: BPS Water Supply Statistics, 1991

Table 2-26 Number of Taxis by Region/Province

	1990	1991	1992
1. Ache	-	-	-
2. North Sumatera	-	158	600
3. West Sumatera	-	48	151
4. Riau	-	-	-
5. Jambi	-	-	-
6. South Sumatera	-	-	11
7. Bengkulu	-	-	-
8. Lampung	-	-	-
9. Jakarta	18,278	18,023	13,125
10. West Java	388	1,033	1,357
11. Central Java	301	489	503
12. Yogyakarta	171	536	511
13. East Java	2,578	3,212	1,961
14. West Kalimantan	-	-	-
15. Central Kalimantan	-	-	-
16. South Kalimantan	-	-	-
17. East Kalimantan	-	-	45
18. North Sulawesi	-	-	107
19. Central Sulawesi	-	-	-
20. South Sulawesi	-	94	96
21. Southeast Sulawesi	-	-	-
22. Bali	-	120	103
23. West Nusa Tenggara	-	-	-
24. East Nusa Tenggara	-	-	-
25. Maluku	-	-	-
26. Irian Jaya	-	-	-
27. East Timor	-	-	-
Total	21,716	23,713	18,570

CHAPTER 3

CURRENT STATE AND PENDING PROBLEMS OF LEGAL METROLOGY IN INDONESIA

CHAPTER 3

CURRENT STATE AND PENDING PROBLEMS OF LEGAL METROLOGY IN INDONESIA

3.1 General

The metrology system is the essential technical basis for the orderly management of a country and its supportive role in modern socioeconomic activities is becoming increasingly more important. It is not only in industrialised countries but also in developing countries that the metrology system plays a part in all aspects of social and economic life in combination with the technical regulations stipulated by various laws.

The ultimate objective of the firm establishment of the metrology system is to ensure economic and cultural development in national life through the establishment and management of a uniform and rational basis for industrial technologies and economic activities. All countries enforce various regulations on metrology as concrete measures designed to maintain fair trade practices, to ensure health and safety and to protect the environment. Industrial and economic development necessarily expands the scope of the metrology system and there are increasing instances of measurement results playing a crucial role.

With the recent progress of borderless economic activities coupled with active trade and cultural exchanges between countries around the world, standardisation of the components of metrology systems from the global point of view has become essential, stimulating international action by the OIML and other organizations. There is, in fact, strong willingness throughout the world community to establish a world metrology system in order to create a worldwide common basis for further economic development and cultural progress.

3.1.1 Basic Concept of Metrology System

Metrology is not simply measurement but is defined as measurement based on officially upheld standards. Under the metrology system, measurement must be conducted in accordance with standard measurement units which are stipulated by law or national standards. All industrialised countries today have their own legal

metrology system which general reflects the national character, history and culture. The basic concept of the metrology system from the macroscopic legal point of view is typified by the German system which is a preventive system presupposing the guarantee of measurement accuracy for a specific period of time. In contrast, the US and UK, etc. have adopted a repressive system under which users are held responsible for the maintenance of metrological accuracy as part of their social responsibility. Although the main emphasis slightly varies from country to country, the legal regulations on metrology in most countries are a combination of the preventive and repressive systems. Regulations are generally classified as structural regulations on measuring instruments and regulations on their scope of use.

3.1.2 Current Legal Arrangements of Metrology System in Indonesia

The metrology system in Indonesia is supported by the Law on Legal Metrology (the Law), related government decrees (some of which are presidential decrees) and ministerial decrees. The Director of the DOM has the legal authority to determine technical issues relating to the implementation of verification through his own decrees, completing the reasonable legal arrangements for Indonesia's metrology system. The Indonesia law and regulations relating to legal metrology are listed below. It is worth noting that the National Standardisation Council has the legal authority to establish a metrological traceability system in the field of industrial metrology based on the Law and backed by government and presidential decrees.

Law and Regulation for legal Metrology

Law No. 2/1981

.Government Decree No. 2/1985 → Ministry of Trade
Scope of Verification on Mesuring Equipment

.Government Decree No. 26/1983 → Verification Fee

↓

.Government Decree No. 10 /1987 → SI Unit

.Government Dcree No. 2/1985

1. No. 401/1981 → Repairer
2. No. 402/1981 → Specied Mesuring Instruments
3. No. 403/1981 → Verification Term
4. No. 404/1981 → Prepacked Products
5. NO. 36/kp/#/88 → Mesuring Equipment should be Verifies
6. No. 406/1981 → The Place for Verification of Special Measuring Instrument
7. No. 407/1981 → *Procedure for desruching of* Measuring Instrument
8. NO. 409/198 → *Proceder for Importing* Measuring Instrument
9. Ministiec Decree of Verification Stamps → Isuuued every year

Law and Regulation for Industrial Metrology

Law NO.2/1981

.Government Dcree NO.2/1989 → National Standards

.Presidential Dcree NO.7/1989 → National Standerdization Corncial

↓

This Council Chooses

- National Labratory
- Accreditation of Calibration Centre(±22)

Pres. → Minister of Reseach & Technical(Mr.Habibie)

1st Deputy → Minister of Industry

2st Deputy → Minister of Trade

Secretary → KIM-LIPI

Members:

1.Depart of Industry
2.Depart of Trade
3.Depart of Health
4.Depart of Agriculture
5.Depart of Forestry
6.Depart of Manpower
7.Depart of Public Works
8.Depart of Mining & Energy
9.Depart of Transportation
10.Tachnology Application Council
11.National Atomic Council

List of Director's Decrees for Measuring Instrument

NO.	Item of Measuring Instrument	Number Director's Decree	Remarks
1.	Electronic Weighing Instrument	No.MET-009/MET-1/1347/83. →1983	
2.	Water Meter	No.MET-4005/2793/1990 - 1990	
3.	Tank Lorries	No.MET-4005/4585/1991 - 1991	
4.	Taxi Meters	No.MET-4005/2781/XII/1990 - 1990	
5.	Moisture Meter	No.MET-4005/3548/XII/1990 - 1990	
6.	Electricity Meter (kWh-Meter)	No.MET-4005/3548/VIII/1991 - 1991	
7.	Measuring Instruments Obliged Initial Ver. & Periodical Ver. or Free of Periodical Ver.	No.MET-4005/1919/1992 - 1992	
8.	Spring balance	No.MET-004/2318/1992 - 1992	
9.	Ditto(Devision)	No.MET-004/3104/1992 - 1992	
10.	Flow Meter(Volumetric)	No.MET-4005/720/1993 - 1993	
11.	Storage Tank	No.MET-4005/721/1993 - 1993	
12.	Gas Meter of Rotary Piston	No.MET-4005/722/1993 - 1993	
13.	Compressed Natural Gas Pump	No.MET-4005/723/1993 - 1993	

3.2 Current Conditions and Problems of Legal Metrology System

A weights and measures law is designed to maintain economic order. As the types of measurement required to ensure fair trade are extremely diverse, it is usually the case that the subjects of technical regulations on the inspection and testing of measuring instruments are restricted to those areas which are essential for the protection of general consumers. While it is a question of state sovereignty to what extent legal metrology should cover, the scope of legal metrology has been widening in all countries in accordance with industrial and economic development. The actual regulatory regime has also been becoming more simplified with the introduction of the type approval system and the private sector-based certification system in addition to the more conventional official inspection and testing.

3.2.1 Legal Regulations

The current Indonesian Law on Legal Metrology enforced in 1975 and revised in 1981 generally covers the areas recommended by the OIML, including the national legal metrology system. Probably by coincidence, the recommendations of the OIML were also issued in 1975 and the Indonesian Law on Legal Metrology (the Law) appears to have incorporated those areas which would have been incorporated anyway because of the OIML recommendations prior to the issue of these recommendations. The combined state of the Law, presidential orders, government ordinances, ministerial ordinances and instructions of the DOM Director General when the Law was enforced satisfied the minimum requirements, at least in all areas of the OIML recommendations, despite the constraints imposed by the stage of socioeconomic development and general conditions in Indonesia at the time.

The rapid economic and social development in Indonesia in more recent years has made the Law, related regulations and administrative system for their enforcement rather inadequate. It is now necessary for the competent agencies, i.e. the DOM of the Ministry of Commerce and the KIM-LIPI of the Ministry of Science and Technology, to examine a new administrative structure and the competent agencies for a much more up-to-date measurement law and its enforcement.

The current problems of the Law and related regulations, including government and ministerial ordinances, are discussed below based on the OIML recommendations and their current conditions are outlined in Table 3-1.

(1) Legal Measurement Units

In principle, the Law stipulates the adoption and use of SI units. Actual provisions are only provided for physical base units and their multiples and sub-multiples, however, and no clear provisions are provided for derived units.

It is a common practice for the measurement laws of industrialised countries and NIEs to clearly stipulate the derived units which are essential for industrial measurement in addition to units for conventional commercial measurement in accordance with socioeconomic progress. More than 50 derived units have been established in all of these countries. In general, there are two ways of establishing the legal framework for measurement units, including derived units. One is to revise and expand the weights and measures law which mainly deals with the inspection of measuring instruments to a more comprehensive measurement law. Another is to introduce a new basic measurement law which is separate from the weights and measures law. The present Law has a comprehensive perspective, covering industrial measurement, while some government and ministerial ordinances also refer to industrial measurement. Therefore, it appears more appropriate for the Law to be modernised to expand its coverage. Which ever way is chosen, it is necessary to establish uniform nationwide measurement standards for all areas of measurement (clear provisions for legal measurement units and standards embodying such units). In addition, the technical standards on measurement in various areas should be made uniform and in harmony with international standards.

(2) Physical Expression of Units

Neither the Law nor the related government and ministerial ordinances provide a clear physical expression of a unit. Although attempts have been made to maintain national meter and kilogramme standards in response to the demand of the OIML, few standards are available and the situation is not helped by the inadequate establishment of units. What is important vis-a-vis the measurement law and related regulations in addition to the clear definition of measurement units in the legal framework is the physical introduction and maintenance of standards which embody such units and the firm establishment of technological strength to enable the introduction and maintenance of these units.

The development and establishment of standards cannot be conducted by a single country. Given the necessary investment, it appears more advisable for developing countries to seek the transfer of technology from or the technical

cooperation of industrialised countries. In this way, the conformity of national standards in developing countries with international standards can be assured.

(3) Application of Units

SI units, which are international measurement units, are believed to be used for all measurements in Indonesia as required by the domestic laws and regulations. While it is the custom for traditional units to be used for certain measurements in some areas, the use of these traditional units is within the permissible scope of the domestic legal framework and is accepted internationally. In the case of legal measuring instruments, all are uniformly based on SI units (metric system).

(4) Measuring Instruments

As described in (3) above, SI units are used for legal measuring instruments in Indonesia and instruments for industrial measurement generally use SI units except in some special cases where units other than SI units are mainly used in local trade.

With regard to the quality of measuring instruments, legal provisions are made for the inspection of new measuring instruments (subject to initial inspection), those which are repaired or altered and those in actual use (subject to re-inspection) in terms of their function and maximum permissible error (accuracy conditions) although there are no provisions in regard to accuracy relating to those standards used for inspection purposes or testers for inspection (calibrators).

The control of equipment accuracy for inspection is extremely important to improve the degree of inspection accuracy and the required accuracy levels should be introduced for standards and measuring instruments used for inspection and calibration purposes, taking the maximum permissible error of the subject items into consideration.

(5) Metrological Control of Measuring Instruments

Regardless of a country being an industrialised or developing country, it is a common practice for a national government to introduce a compulsory system to control the initial 100% inspection, re-inspection and type approval testing, etc. of measuring instruments which are directly related to such consumer interests as fair trade and public health. The OIML recommendations also make

it compulsory for a national government to enforce the metrological control of those measuring instruments which are used as standards for the inspection of ordinary measuring instruments, special measuring instruments used in such specific areas as public health and technical safety, those used in association with commercial transactions, tax collection and postal services and those used for or planned to be used for legal appraisal.

The OIML recommendations also stipulate the following types of government control and allow a simplified procedure for measuring instruments which are mass produced by an automated production line.

① Control through sampling

② Approval of the manufacturer's mark

③ Type approval

④ Initial inspection

⑤ Re-inspection following repair or alteration

⑥ Regular inspection

⑦ Monitoring of the selection of measuring instruments

In reality, each country combines some of the above types of control to create its own compulsory control system which reflects the socioeconomic stage of development, the structural types and technological levels of popularly used measuring instruments, the awareness level and behavioural patterns of consumers and the prevailing attitude of the administration towards consumer protection, etc.

The Law and related regulations in Indonesia almost uniformly demand ③ type approval, ④ initial inspection, ⑤ re-inspection following repair or alteration and ⑥ regular inspection in relation to the validity of inspection approval for all legal measuring instruments. From the legal point of view, Indonesia appears to be one of the strictest countries in terms of compulsory supervision by the government.

The reality is that it is not as strict as it could be, however, because of the limitations caused by the shortage of equipment and manpower which is also responsible for the rather unsatisfactory national average figure of some 60-70% for the re-inspection rate or capture rate for re-inspection. A review of the

appropriateness of the present uniform application of the limited control resources of the government is now highly necessary with a view to the possible introduction of priority distribution to achieve maximum rationalisation in the use of these limited resources, taking into account the changing social needs due to socioeconomic development, the diversification of the structure and technology of measuring instruments, the improved quality control of mass-produced products by large manufacturers, the desirable national control of measuring instruments used in large numbers in department stores and supermarkets, etc. and the increase of the number of workplaces requiring metrological certification.

(6) Metrological Control of Measurement

The current metrology system mainly regulates the various inspections of measuring instruments and does not clearly stipulate the metrological control of measurement. Consequently, huge oil and gas storage tanks are also considered to be measuring instruments and are subject to inspection. This seems to be typical and one of the OIML recommendations refers to the case in which technological efforts to verify the conformity of a measuring instrument with the required metrological inspection criteria become disproportionally large compared to the economic importance of the instrument in the sector in which it is meant to serve.

Consequently, it is preferable to examine a way to change the measurement control system from the direct inspection of tanks to the flow meter inspection system and/or a combination of measurement system approval by a metrological engineer on the premises with the authority to conduct metrological control. Such a control regime also seems to be applicable to the inspection of scales in department stores and supermarkets, etc. in addition to such items as huge storage tanks in view of the questionability of such items being subject to inspection from the viewpoint of economic rationality.

(7) Metrological Control of Quantities of Products and Packed Commodities

The metrological control of the quantitative aspects of products and packed commodities must be flexibly determined, taking into account (i) the diversity of their physical characteristics, (ii) the multiple modes of their trading, (iii) the legally obligatory product indications and (iv) the regulations on the maximum permissible error of these indications, etc. Accordingly, the metrological

control method employed by the government must be flexible and adaptable to the various physical characteristics of products/commodities.

In some cases, the standardisation of packed commodities must be promoted with corresponding changes of the metrological control regime of the government.

While the current regulations in Indonesia based on the Law stipulate the items to be indicated and the maximum permissible error in the quantity, etc., the metrological control arrangements, including its actual enforcement method, are inadequate. Moreover, the standardisation of the control regime is also inadequate.

(8) Manufacture, Repair and Sale of Measuring Instruments

The Law requires those engaged in the import, manufacture and/or repair of specified measuring instruments to register with the Ministry of Commerce but has no specific regulations relating to individuals or companies engaged in the sale and/or leasing of measuring instruments. It is necessary for the Government of Indonesia to introduce a registration system for these retailing and leasing businesses based on certain criteria in order to properly deal with the increasing complications in the distribution channels for measuring instruments due to economic development and also due to the expected increase of the number of leasing businesses following the technological advancement and rising prices of measuring instruments.

(9) Personal and Company Obligation

The Law stipulates the obligation of individuals or companies engaged in the import, manufacture, repair, sale and/or leasing of specified measuring instruments to be subject to the metrological control of the government. Having introduced clear provisions regarding the obligation of those using or possessing specified measuring instruments to have such instruments under the control of the government pursuant to the relevant domestic law and regulations, Indonesia appears to have heeded the OIML recommendations.

Because of the uniform control of specified measuring instruments mainly by means of government inspection under the Law, however, the obligation to be under government control has in fact taken the form of confirming the attachment of the inspection approval mark on each instrument. It the control

method is to be diversified, the form of obligation of being under government control will inevitably be diversified, making it necessary to stipulate each form of obligation in a clear and detailed manner.

(10) Metrological Inspection Organization

The OIML recommendations include the establishment of a national metrological inspection organization which is responsible for the enforcement of the national measurement law and describe the structure and character of such an organization.

[Legal Metrology Organization]

The national metrological inspection organization recommended by the OIML is, in practice, a central legal metrology organization which conducts the following with the assistance of a standing council and central and metrology control organizations.

1) Establishment, storage and maintenance of primary and secondary domestic standards for legal measurement units.
2) Enforcement of legal metrology regulations prepared based on the basic measurement law.
3) Finalisation of the technical regulations for measuring instruments, the control of which is the obligation of the government.
4) Implementation of the type approval testing of measuring instruments.
5) Establishment, calibration and inspection of standards.
6) Inspection and monitoring of the use of measuring instruments.
7) Appraisal of measurements and supply of measurements on demand.
8) Preparation and enforcement of regulations on the measurement of certain types of products or commodities and also on labelling.
9) Participation in general education on legal metrology and training of civil servants conversant with metrology.
10) Establishment of a close relationship with other domestic organizations in areas related to metrology.
11) Representation of the country vis-a-vis international metrological organizations.

[Staff Members of Legal Metrology Organization]

In addition to a director, the legal metrology organization should appoint cooperators in the fields of science, technology, law and administration to ensure the smooth and effective operation of the organization. The organization should be allowed to request members of other government agencies and private organizations to conduct specific tasks upon receipt of approval for such assignment by the agencies/organizations concerned.

In Indonesia, the DOM acts as the national legal metrology organization responsible for the overall enforcement of the Law while the KIM-LIPI has a similar role in the field of industrial metrology. The actual inspection work is conducted by 47 local inspection laboratories, consisting of provincial laboratories belonging to 27 provincial offices of the Ministry of Commerce and those laboratories belonging to the branches of the above provincial offices. The role and functions of the DOM are in line with the recommendations of the OIML. While there is room for improvement in terms of facilities and the expertise of staff members, it is evident that the DOM is trying very hard to conduct its tasks.

(11) Authority of Legal Metrology Organization

Each technical staff member of the DOM is required to have the technical qualifications relevant to his/her status as an inspector, assistant inspector, controller or technical assistant and must undergo education/training courses to obtain the relevant certificate issued by the government. The officials of the DOM have the authority to freely enter industrial and commercial premises where measuring instruments subject to legal metrological control are owned or installed or are believed to be owned or installed in order to conduct the inspection or investigation of such instruments. This arrangement completely satisfies the relevant OIML recommendation.

(12) Jurisdiction Over Legal Metrology Organization

By law, the Ministry of Commerce has direct administrative jurisdiction over the legal metrology organization. However, a superior organization called the Metrology Council, consisting of representatives of all related ministries and agencies and with direct linkage to the President, has overall authority and responsibility for the administration of metrology.

(13) Financial Arrangements

The fees for inspections and type approval tests, etc. in Indonesia are stipulated by a government ordinance and the collection work, procedure and methods are clearly set forth.

The amount of collected fees is only equivalent to some 40% of the total cost of enforcing the use of legal measuring instruments and it is necessary to examine the appropriateness of the present level of fees. The OIML recommendations make it clear that it is highly desirable for the collected fees to be used to finance the improvement of the legal metrology organization. The Government of Indonesia must be reminded of the fact that the amount of monetary injection from both the central and local government budgets to maintain and upgrade the legal metrology system is usually quite large in any industrialised or developing country.

(14) Violations

The legal procedure and punishments in regard to any violation of the Law are clearly stipulated in Indonesia and are strictly applied.

(15) Interim Arrangements

The Law has been gradually enforced with the issue of relevant government and ministerial ordinances and enforcement orders (orders by the DOM's Director General). The Ministry of Commerce (the competent administrative agency for the DOM) decides the gradual enforcement of the provisions of the Law based on the opinions of metrological organizations (the DOM and local inspection laboratories) while securing the consent of related administrative organizations (the Ministry of Science and Technology and the Ministry of Industry, etc.)

In general, the deferment period for the enforcement of a regulation is 6-12 months after the announcement of the regulation. It is a common practice in all countries to execute the gradual enforcement of regulations on measuring instruments to reflect the specific local conditions with the establishment of a total enforcement regime which allows no exceptions within 5 years.

There have been many cases in Indonesia where the announced legal provisions have not been actually enforced or only partially enforced for a long period of time due to the inadequate provision of national measurement standards, the difficulty of investing in inspection facilities and the quantitative and qualitative

shortage of measurement engineers and inspectors. These shortcomings must be improved as they adversely affect the authority of the Law.

3.3 Legal Metrology Implementation System

The implementation of legal metrology is conducted by the DOM, an organization belonging to the Department of Trade, and 47 local verification laboratories belonging to the respective local offices of the Department of Trade.

3.3.1 Role and Organizational Structure of the DOM

(1) Role and Functions

The role and functions of the DOM are stipulated by the Law and are outlined below.

1) Metrological Administration

The Director of the DOM issues decrees governing the technical requirements for the implementation of legal metrology in general and the enforcement of the Law in particular to ensure the unified operation of verification.

2) Inspection (Calibration) of Reference Standards

The DOM conducts the regular inspection (for example, every 5 years in the case of standard weights) and calibration of reference standards which are the standards in the possession of the local verification laboratories. The inspection and calibration of working standards are assigned to the laboratories.

Small laboratories find it difficult to appoint a specialist inspector for each type of measuring instrument to be verified due to the limited verification demand for each item. In addition, there are such problems as a shortage of calibration equipment and an inadequate level of calibration accuracy, etc. The control of working standards by these small laboratories is problematic to say the least because of the inadequate technical ability of the staff and inadequate equipment. It is, therefore, necessary to upgrade the metrological engineers and calibration equipment at key laboratories so that the centralised inspection and calibration of working standards can be conducted by these key laboratories.

3) Type Approval Inspection (Testing)

At present, the DOM cannot fully conduct type approval inspection (testing) because of qualitative and quantitative shortages of testing equipment and inspectors.

In regard to watt-hour meters, the type approval test is relatively new and uses facilities owned by watt-hour manufacturers. The test is not yet widely conducted and it is currently impossible to check all items of which testing is technically required.

4) Technical Guidance for Local Verification Laboratories

The DOM is trying to positively respond to requests made by local verification laboratories for technical guidance. The current system does not allow the active provision of such guidance, however, because of both budgetary constraints and organizational barriers (the laboratories are independent from the DOM).

5) Technical Advice on Personnel Affairs of Local Verification Laboratories

As the local verification laboratories belong to the local administrative offices of the Department of Trade, the DOM does not have direct control over the personnel affairs of the former. However, the DOM does act as a coordinator for personnel movement between laboratories by providing technical advice on the appropriate appointment of verification inspectors and others.

6) Improvement/Renewal of Verification Facilities of Local Verification Laboratories

Twenty percent of the verification revenue earned by the local verification laboratories goes to the DOM for re-distribution to improve/renew the verification facilities of those laboratories in need. However, there is a large gap between the funds available for distribution and the amount requested by the laboratories and it is practically impossible for the DOM to improve the current level of facilities let alone fund their renewal.

(2) Organizational Structure

The DOM belongs to the Directorate General for Domestic Trade of the Department of Trade and is located in Bandung. The DOM consists of 6 divisions, each of which has several sections as described below.

1) Administration Division:
General Affairs; Personnel; Accounting

2) Mass Measurement Division:
Mass Standards; Electronic and Mechanical Measurement; Force and Pressure

3) Flow Measurement Division:
Petroleum Meters; Liquefied Gas Meters; Drinking Water Meters; Electrical and Time Measurement

4) Length and Volume Division:
Length Measurement; Tank Measurement; Taxi Meter Measuring Instruments; Density, Temperature and Viscosity

5) Control and Information Division:
Litigation Procedure and Data Collection; Measuring Instruments; Packed Product Control; Information

Fig. 1 and Fig. 2 show the organizational structure of the Department of Trade and the DOM respectively.

(3) Building

The total floor area of the DOM building is 4,054 m^2, standing on premises of 9,738 m^2. Half of the floor area is taken up by the Administration Division and the current space for such technical facilities as the metrological standard room and calibration laboratories is rather small vis-a-vis the functions required of these facilities. The layout does not take the function of each room, such as the storage and control of standards, calibration or type approval testing, into account. The provision of auxiliary facilities, including air-conditioning, sound insulation and vibration proofing, etc., is inadequate vis-a-vis the required level for a metrological research institute. Following the relocation of the neighbouring Metrological Training Centre, the current layout of the DOM building must be fundamentally reviewed and large-scale remodelling should be

conducted to bring all aspects of the DOM up to the level required of a metrological research institute. Fig. 3 shows the present layout of the DOM building.

(4) Measurement Facilities and Equipment

The current measurement facilities (equipment) of the DOM are listed in Table 3-7. These are, however, generally insufficient in terms of both quantity and quality except for some metrological standards. The type approval testing facilities and calibration equipment are particularly inadequate. The procurement and/or renewal of these facilities and equipment as proposed in a later chapter is urgently required. As part of the efforts to upgrade the facilities of the DOM, it is desirable to transfer still usable equipment in terms of accuracy from the DOM to the local verification laboratories to replace the deteriorated equipment of the latter.

(5) Manpower

As of 1993, the DOM has total manpower of 144, of which 87 work in the administration division. The technical staff number of 57 is too small to fully conduct all the expected technical functions of the DOM and should be increased to approximately 70. The breakdown of the technical staff members in terms of qualifications is as follows.

①	Inspectors	32
②	Assistant Inspectors	2
③	Controller	1
④	Technical Assistants	22

3.3.2 Role and Organizational Structure of Local Verification Laboratories

There are 47 local verification laboratories throughout Indonesia, of which 27 are division-class laboratories which are located in each of the 27 local provinces while 20 are section-class laboratories which are located in large provinces.

(1) Role and Functions

The expected role and functions of the local verification laboratories are largely classified into the following 4 categories.

1) *Verification of Legal Measuring Instruments*

The following measuring instruments are currently subject to verification under the legal metrology system.

① Mass (scales and weights)

② Length (linear scales and tape measures, etc.)

③ Watt-hour meters

④ Gasoline meters

⑤ Taxi meters

⑥ Gas meters

⑦ Tank volumes of petrol stations and tank lorries, etc.

⑧ Stop watches, parking meters, phone use meters.

⑨ Flowmeter

⑩ Pressure Ganges.

⑪ Thermometers.

⑫ Hydrometers, viscometers, liquefied gas meters.

Depending on the laboratory size and local characteristics of the subject area, some laboratories do not conduct the verification of some of the items listed above. (For example, there are no taxis equipped with a taxi meter in Ambon.) Most initial verifications are conducted by a small number of local laboratories as the applicants are manufacturers. At present, only 8 cities have a city gas supply and the overall diffusion rate in these cities is quite low. Consequently, the DOM is engaged in the verification of gas meters on only a limited scale because of the low demand and the lack of verification facilities at the local laboratories.

2) PR for Verification and Prosecution of Violaters

The controller (metrology police) visits the owners of those measuring instruments requiring regular verification to make them aware of the need for verification and to check any violation of the Law and related regulations. If necessary, the controller requests the company of the police and proceeds with the prosecution procedure.

3) Control and Calibration of Working Standards

Some laboratories are obliged to request the calibration of working standards to other laboratories because of a lack of the relevant calibration equipment. In general, however, all the laboratories have sufficient calibration equipment for those quantities with a high calibration demand such as mass and length. The storage conditions of the working standards are unsatisfactory due to a lack of air-conditioning and other reasons. Other problems include the relatively low technical ability of the staff, deterioration of the calibration equipment and poor calibration accuracy, damaging the credibility of the calibration results.

4) Calibration of Measuring Instruments On Request

Some large laboratories provide a calibration service in the field of industrial metrology in response to a strong request by industrial circles. The accuracy of the calibration equipment and calibration technologies/ techniques employed are rather questionable, however, and the demand is not fully met.

(2) Organizational Structure

The local verification laboratories belong to the local offices of the Department of Trade and operate as an arm of the local administration. The size of such local offices depends on the size of the local administration. Accordingly, while the general status of a local verification laboratory is equivalent to a division, there are 2 types of laboratories based on the scope of business. When 2 or more laboratories are located in a single province, they have the status of a section and are classified into 2 types based on the scope of business.

Some laboratories are in favour of being integrated to the DOM as lower ranked organizations of the latter to facilitate the uniform operation of the metrological administration. This possibility must be carefully debated as it affects the present administrative arrangements. Given the unique nature of the metrological administration, this possibility exists and warrants further discussion. In Thailand and the Philippines, etc., there is indeed an organizational link between the central metrological research institute and local verification laboratories.

(3) Buildings

As Table 3-2 shows, the buildings currently used to house the local verification laboratories vary from independent laboratory buildings where the functions of a laboratory are duly performed to local office buildings of the Department of Trade which are not functional enough for use as a verification laboratory and further to simple wooden houses which are rented for use as a laboratory.

Given the functions of the local verification laboratories, an independent, permanent building is highly desirable, making the rebuilding or substantial remodelling of the existing buildings necessary at more than half of the laboratories.

Air-conditioning is a minimum requirement for the control of working standards. In addition, there are also elements of possible environmental pollution in the case of the verification of taxi meters and tank lorries, etc. Proper consideration should be given to preventing pollution and ensuring a good working environment when planning any rebuilding or remodelling. Due to the importance of improving the present physical state of the local verification laboratories, an improvement project is proposed in Chapter 6.

(4) Measurement Facilities and Equipment

The verification equipment available for each metrological category is detailed in 3.4 onwards. In general, most of the working standards and verification equipment appear to have been used for a long time and are showing signs of deterioration. In fact, more than half of the equipment has passed its expected life and require renewal, implying a need for large amount of investment. It is, therefore, essential to provide budgetary appropriation in a systematic and continuous manner to renew the working standards and verification equipment at the laboratories to ensure verification accuracy and efficiency. A project to improve this aspect of the local verification laboratories is also proposed in Chapter 6.

The number of vehicles to assist re-verification (collective verification) is inadequate and many of the existing vehicles are old. The new procurement and replacement of vehicles are required to increase the number of collective verifications, in turn required to improve the re-verification detection rate.

The paper work for verification is almost entirely conducted manually at the small and medium size laboratories, causing problems in terms of work efficiency and the effective utilisation of data. The introduction of such essential office equipment as personal computers and copiers, etc. is necessary to modernise and rationalise the clerical work.

(5) Manpower

Based on the increase of the work volume in the last 4 years, the expected improvement of the re-verification detection rate and the expected growth of commerce and industry in Indonesia, the average annual growth rate of the number of measuring instruments in use is estimated to be approximately 8% for the next 10 years, commencing in 1993. By 2002, the verification demand will be some 180% of the present level. It must be noted that this figure does not include those measuring instruments to be newly added to the list of measuring instruments subject to metrological verification. Assuming an annual productivity improvement of 2% for staff members, including administrative staff, the present manpower strength of the local verification laboratories of 1,456 should be increased 170% to some 2,400 by 2002.

Unfortunately, the present situation does not permit a smooth increase of manpower because of the salary gap between the private sector and public sector and the limited ability to train new inspectors. A reasonable solution is the substantial reform of the legal metrology system, including revision of the Law, so that the total manpower at this level remains around 1,500 9 years from now, but is sufficient. Possible measures to make this possible are discussed below.

1) Introduction of Designated Manufacturer System

A manufacturer of measuring instruments which has an excellent quality control track record may be allowed to appoint a certified metrological engineer to be responsible for the metrological aspects of manufacturing activities. This control system can then be certified and initial verification can be substituted for in-house inspection .

2) Introduction of Designated Verification Organization System

For those measuring instruments of which the verification facilities and equipment require substantial investment and the direct possession of which is limited to only a few, the designation of certain verification

organizations to be responsible for the verification of such instruments is highly effective to rationalise the verification regime and to make the best use of equipment investment and the professional knowledge of metrological engineers through their concentration in these organizations. This system is applicable for watt-hour meters, gas meters, water meters and environmental measuring instruments, etc. As the owners of these meters are the electricity board, water board and local governments, it should be feasible for the running cost of the designated verification organizations to be met by the verification fee (imposed on the benefit principle).

3) Designation of Verified Measuring Instrument Users

When an in-house inspection and calibration system for measuring instruments under the control of a certified metrological engineer has been firmly established at a department store, supermarket or large enterprise which uses a large number of measuring instruments, the system can be designated as being exempt from re-verification.

4) Introduction of Designated Metrological Certification Business System

Anyone whose business is the issue of metrological certificates is required to obtain the qualification of a certified metrological engineer while the inspection and calibration of reference standards, the possession of which is a compulsory requirement for such businesses to be designated as such, are conducted by a key local verification laboratory to rationalise the verification process.

3.4 Current State and Problems of Legal Metrology

3.4.1 General

The First and Second Field Survey Teams visited the DOM and its 9 local inspection laboratories and examined the conditions of inspection, availability and conditions of inspection equipment and buildings and qualitative level of inspectors, etc. The Survey Teams also collected data and information relating to the inspection records, number of inspectors and scope of equipment and instruments in possession, etc. at 47 local inspection laboratories and analysed the current conditions of these laboratories.

(1) Inspection Organizations

There is a total of 47 local inspection laboratories in Indonesia which are responsible for day-to-day inspection work. Their geographical distribution is mainly concentrated in Sumatera and Java as shown below.

Sumatera	10
Java	20
Kalimantan	6
Sulawesi	3
Bali	1
Tenggara	4
Irian Jaya	2
Timor	1

The 9 local inspection laboratories of the DOM which were visited are as follows:

Large-Size Laboratories	: Jakarta, Bandung, Medan and Surabaya
Medium-Size Laboratories	: Surakarta, Denpasar and Palembang
Small-Size Laboratories	: Bojonegoro and Anbon

In addition to these laboratories, the Survey Teams visited manufacturers of measuring instruments and university research institutes to obtain a general picture of the metrology system in Indonesia.

(2) Conditions of Inspection at Local Inspection Laboratories

The surveys at the DOM and its local inspection laboratories found, based on the survey findings on the control of standards, actual inspection work and conditions of re-inspection (equivalent to regular inspection in Japan) using the collective inspection method, that metrological inspection is conducted in fairly strict accordance with the legal regulations. Points worthy of special note are the practice of sealing those measuring instruments which have passed the initial inspection or re-inspection to prevent any subsequent alteration or remodelling of these instruments, the stamping of not only the pass mark but also the laboratory mark and inspector's mark and the fair number of criminal

prosecutions regarding violation of the statutory re-inspection and other requirements.

(3) Inspection Records

The initial inspection and re-inspection records for the 3 year period since 1990 are shown in Table 3-4 while the total number of inspection by item is given in Table 3-5. The total inspection volume of approximately 6.5 million pieces/year was fairly stable for these 3 years.

In the case of mass-related inspections, most of the subjects were domestically manufactured instruments except truck scales and electronic balances. All watt-hour meters were domestically manufactured by joint ventures with foreign capital, including Japanese capital. More than 20% of the water meters were imported products while all the taxi meters were imported products.

By instrument category, those instruments relating to mass accounted for the largest proportion. The initial inspection completion rate was almost 100%.

The inspection volume is expected to continuously increase in the future with an increasing demand for such utility service-related meters as watt-hour meters and water meters and also with an improved detection rate for scales and other measuring instruments used.

Analysis of the inspection volume by product type shows the dominant use of wet cans for volume measurement. The inspection volume of wet cans was quite steady in the 3 year period, standing at some 770,000 pieces in 1992. The most numerous metering item inspected in 1992 was watt-hour meters at some 610,000 pieces, followed by water meters at approximately 250,000 and taxi meters at 20,000. The inspection record watt-hour meters showed an increase of 445% on the previous year and is expected to gradually but steadily grow in the future following the increased installation of watt-hour meters in households due to the progress of electrification.

The total number of initial inspections and re-inspections conducted on main measuring instruments in the 3 years since 1990 is given below.

Item \ Year	1990	1991	1992
Length	52,004	44,745	43,558
Mass	5,007,720	5,060,670	5,243,116
- Weights	(3,347,197)	(3,889,235)	(4,017,413)
- SIMPL	(28,536)	(29,148)	(29,096)
- Balances	(1,131,987)	(1,142,287)	(1,196,607)
Volume	1,217,770	1,081,648	1,207,667
- Cans	(1,205,431)	(1,068,444)	(1,193,871)
- Tanks	(11,845)	(12,662)	(12,947)
- Others	(494)	(542)	(849)
Water Meters	220,762	266,262	252,682
Flow Meters	1,621	1,532	1,921
Gasoline meters	8,285	9,206	11,116
Taxi Meters	21,716	23,768	19,781
Watt-Hour Meters	12,621	137,155	610,970

(4) Number of Inspectors

The staff members of the DOM and its local inspection laboratories are classified as inspectors responsible for actual inspection, assistant inspectors, controllers responsible for the enforcement of metrology laws and regulations, technical assistants without the relevant qualifications and administrative staff.

1) DOM

The staff composition of the DOM for the 5 years since 1989 is shown below.

	Inspectors	Assistant Inspectors	Controllers	Technical Assistants	Administrative Staff	Total
1989	29	0	5	25	90	149
1990	30	0	5	26	88	149
1991	31	2	4	26	87	150
1992	31	1	8	24	83	147
1993	32	2	1	22	87	144

The number of inspectors in these 5 years only slightly increased. The relative dominance of the administrative section was quite noticeable with administrative staff accounting for some 60% of the DOM's total manpower. Inspectors at the DOM are not directly involved in the initial inspection or re-inspection of measuring instruments and are responsible for the inspection (calibration) of standards held by the local inspection

laboratories, the maintenance and control of standards used for the inspection (calibration) of subordinate standards and type approval tests.

2) Local Inspection Laboratories

The staff composition of the 47 local inspection laboratories for the 5 years since 1989 is shown in Table 3-3. The number of inspectors steadily increased every year with an increase of 60% to 342 in 1993 from 214 in 1989. The total number of staff, however, was almost level in the 4 years between 1989 and 1992 and slightly increased in 1993. The total number of staff in 1993 was 39 more than the 1989 level, a 3% increase in the 5 year period. The manpower strength of the 9 local inspection laboratories surveyed in 1993 is shown below.

	Inspectors	Assistant Inspectors	Controllers	Technical Assistants	Administrative Staff	Total
Jakarta	17	3	10	12	23	65
Surabaya	13	3	10	15	8	49
Medan	12	5	5	9	17	48
Bandung	9	5	7	8	14	43
Surakarta	14	2	8	8	9	41
Denpasar	9	7	1	5	9	31
Palembang	7	5	3	5	7	27
Bojonegoro	4	1	7	3	4	19
Anbon	2	4	1	3	7	17

There was a slight discrepancy in the manpower strength of the different laboratories, as shown by 8 inspectors at Bandung Laboratory, a large-size laboratory, compared to 14 and 9 at Surakarta and Denpasar Laboratories respectively, both of which are medium-size laboratories. It is, however, wrong to draw a hasty conclusion regarding the capability of each laboratory based on the current manpower level as the manpower quality and types of work conducted require clear assessment prior to reaching any conclusion. In general, it is safe to say that the systematic development of manpower, particularly instructors, should be planned to strengthen the local inspection laboratories.

(5) Measuring Instruments

1) Standards

The standards held by the local inspection laboratories are calibrated by the DOM every 5 years and are used to calibrate their own inspection standards every year to maintain the traceability of all standards.

The master standards allocated to all local inspection laboratories include a highly accurate standard linear scale, a Class E2 1kg standard weight, a highly accurate standard balance and standard tanks (for water and tank lorry meters). The larger laboratories are also equipped with inspection facilities for taxi meters and electric meter. Table 3-4 lists the measuring instruments held by each of the 47 local inspection laboratories. Standards which are commonly available at all the laboratories are given below.

① Mass

- Class E2 standard weights: 1mg - 1kg
- Class F1 standard weights: 1mg - 1kg
- Third Class standard weights: 1kg
- Working standard weights: 1mg - 25kg
- High precision standard balances - Class C: 1kg, 50g, 1,000mg
- Inspection-grade balance - Class A: 15kg
  Class B: 10kg
- Hydrostatic balance: 0.5 kg

② Volume

- Glass volume tubes: 5mℓ - 1,000mℓ
- Volume tubes: 5, 10, 20, 50, 100, 200, 500, 1,000 litres

③ Flow

- Portable electronic secondary standard meter

④ Length

- Class 3 length standards
- Working length standards
- Comparator