JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DIRECTORATE FOR STANDARDS AND QUALITY(STAMEQ),
MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT
THE SOCIALIST REPUBLIC OF VIET NAM

STUDY ON DEVELOPMENT OF INDUSTRIAL STANDARDIZATION, METROLOGY, TESTING AND QUALITY MANAGEMENT IN THE SOCIALIST REPUBLIC OF VIET NAM

JANUARY 1998

UNICO INTERNATIONAL CORPORATION
JAPANESE STANDARDS ASSOCIATION
OVERSEAS MERCHANDISE INSPECTION CO., LTD.

TOKYO, JAPAN

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Preface

In response to a request from the Government of the Socialist Republic of Viet Nam, the Government of Japan decided to conduct of the Study on Development of Industrial Standardization, Metrology, Testing and Quality Management, and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to Viet Nam a study team headed by Mr. Tetsuo Inooka, UNICO International Corporation, and organized by UNICO International Corporation, Japan Standards Association, and Overseas Merchandise Inspection Co., Ltd., from March to December 1997.

The team held discussions with the officials concerned of the Government of Viet Nam and conducted a field study. After its return to Japan, the team conducted further studies and compiled the results in this report.

I hope this report will contribute to the further development of industry in Viet Nam and to the enhancement of friendly relations between the two countries.

I wish to express my sincere appreciation to all those who participated in this study project for their close cooperation with the team.

January 1998

Kimio Fujita
President
Japan International Cooperation Agency

January 1998

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. Fujita

Letter of Transmittal

We are pleased to submit to you the final report on the Study on Development of Industrial Standardization, Metrology, Testing and Quality Management (SMTQ) in the Socialist Republic of Viet Nam. The report contains analysis of the present status and issues of industrial standardization and quality control in the industrial sector, particularly the subsectors of machinery, electric/electronic appliances and machinery, and metal working. The report also contains analysis of the present situation and issues of SMTQ in the country, and the recommendations on development of SMTQ.

The major emphasis of SMTQ activities in Viet Nam has been placed on quality control (or quality regulation) of products produced or distributed in the country to prevent substandard goods from distribution, as seen typically with the quality registration system. However, company standardization and quality management are not successfully disseminated and established among the industry in Viet Nam so far, in that it is not directly linked with improvement of operational efficiency.

We made the recommendations particularly in view of, the idea that firstly, standardization and quality management should be mainly promoted for improvement of industrial efficiency, simplifying trade, and ensuring fairness of trade, rather than administrative control and regulation purposes of the government; secondly, standardization should be developed with participation of industries and enterprises; and thirdly, the SMTQ system should be strengthened with the target to realize international recognition.

Viet Nam side has showed a deep interest in the implementation of these recommendations. With the implementation of the recommended programs, we are certain that they will contribute significantly to improvement of efficiency and

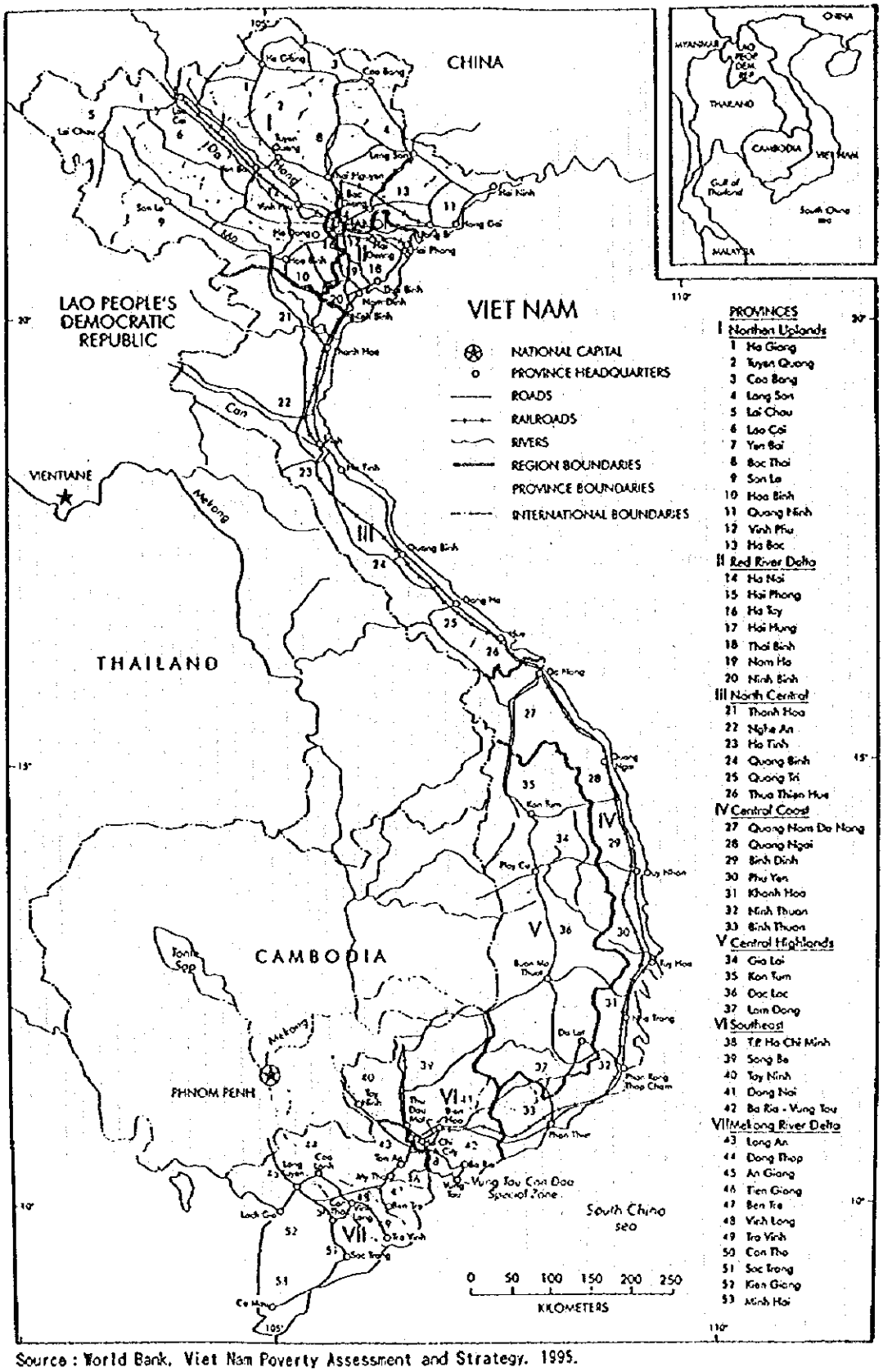
competitiveness of Vietnamese industry, recovery and further promotion of inter- and intra-industry linkages, and increase in international confidence in Vietnamese products. Yet, the expertise in Viet Nam needed for materializing the recommendations seems to be insufficient, and we believe that your further assistance in the implementation process will be highly appreciated.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, and Ministry of International Trade and Industry for valuable advice and support provided on behalf of this study. We also wish to express our deep gratitude to STAMEQ (Directorate for Standards and Quality) and other authorities concerned of the Socialist Republic of Viet Nam for the close cooperation and substantial assistance rendered to us during the performance of this study.

Very truly yours,

Tetsuo Inooka
Team Leader, Study on Development of
Industrial Standardization, Metrology, Testing
and Quality Management
in the Socialist Republic of Viet Nam

Map of Viet Nam



Source : World Bank, Viet Nam Poverty Assessment and Strategy, 1995.

Abbreviation

AASHTO	American Association of State Highway and Transportation
ABB	Asea Brown Boveri
ACCSQ	ASEAN Consultative Committee for Standards and Quality
AFTA	ASEAN Free Trade Area
AIB	Approved Inspection Body
API	American Petroleum Institute
APLAC	Asia Pacific Laboratory Accreditation Cooperation
APLMF	Asia Pacific Legal Metrology Forum
APMP	Asia Pacific Metrology Program
APQ	Act on Product Quality
APQO	Asia Pacific Quality Organization
AS	Australian Standards
ASEAN	Association of South-east Asian Nations
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BOA	Bureau of Accreditation
BS	British Standards
CAC	Codex Alimentarius Commission
CBU	Complete Built Up
CE	Comunitè Eurpèen
CE meter	Carbon Equivalent meter
CEPT	Common Effective Preferential Tariff
CKD	Complete Knock Down
CNC	Computerized Numeric Control
COMECON	Council of Mutual Economic Assistance
CPV	National Congress of Communist Party of Viet Nam
DIN	Deutches Institut Fur Normung
DOSTE	Department of Science, Technology and Environment
DY	Deflection Yoke
EAN – International	European Article Numbering – International
EN	European Norms

EU	European Union
EVN	Electricity of Vietnam
FBT	Fly Back Transformer
FDI	Foreign Direct Investment
FY	Fiscal Year
GDP	Gross Domestic Product
GE	General Electric Co.
GOST	Standards of Former Soviet Union
IAEA	International Atomic Energy Agency
IAF	International Accreditation Forum
IATCA	International Auditor, Training & Certification Association
IC	Information Center
ICS	International Classification for Standards
IEC	International Electrotechnical Commission
IKD	Incomplete Knockdown
ILAC	International Laboratory Accreditation Cooperation
INST	Institute of Nuclear Science and Technique
IP	Institute of Petroleum
IQA	Institute of Quality Assurance
IRCA	International Register of Certified Auditor
ISO	International Organization for Standardization
ISO/IEC Guide	Guides developed and published by ISO and IEC
J/V	Joint Venture
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
JSA	Japanese Standards Association
KRISS	Korea Research Institute of Standards and Science
MIE	Vietnam Machine & Industrial Equipment Corporation
MOSTE	Ministry of Science, Technology and Environment
MPI	Ministry of Planning and Investment
MRA	Mutual Recognition Agreement
MSTQ	Metrology, Standardization, Testing and Quality Control
MT	Magnetic Particle Testing (Examination)

NAFTA	North American Free Trade Agreement
NDT	Non-destructive Testing
NEC	Not elsewhere classified
NIEs	Newly Industrial Economics
OIML	International Organization of Legal Metrology
OMIC	Overseas Merchandise Inspection Co., Ltd
PAC	Pacific Accreditation Cooperation
PASC	Pacific Asia Standards Congress
PM	Project Manager
POMIMECO	Power and Mining Mechanical Corporation
PSB	Singapore Productivity and Standards Board
PVPDC	Petrovietnam Processing and Distribution Company
QA	Quality Assurance
QC	Quality Control
QM	Quality Management
QPVN	Vietnam Code of Practice
QUALIMENT	Quality Management Training Network
QUASEI	Quality Service International
QUATEST	Technical Centers for Quality Assurance-Testing-Measurement
RT	Radiographic Testing (Examination)
S/W	Scope of Work
SAE	Society of Automobile Engineers
SC	Sub-technical Committee
SFIB	Specified Foreign Inspection Body
SIRIM	Standards and Industrial Research Institute of Malaysia
SKD	Semi-knock Down
SME	Small and Medium Scaled Enterprise
SMEDEC	SME's Development Support Center
SMQ	Office(department) for Standardization, Metrology and Quality Control
SMTQ	Industrial Standardization, Metrology, Testing and Quality Control
SO	Staff Officer
SQC	Statistical Quality Control
SSC	Southern Steel Corporation

STAMEQ	Directorate for Standards and Quality
ST-SEV	Standards Developed and Published by COMECON (former)
TA	Technical Assessor
TC	Standards (Company Standard)
TC	Technical Committee
TC	Training Center
TCN	Branch Standards
TCVN	Vietnam Standards
TQM	Total Quality Management
TRI	Textile Garment Research Institute
UL	Underwriters' Laboratories
USA	United States of America
USSR	Union of Soviet Socialist Republic
UT	Ultrasonic Testing (Examination)
VAT	Value Added Tax
VCCI	Chamber of Commerce and Industry of Vietnam
VEAM	Vietnam Engine & Agricultural Machinery Corporation
VEC	Vietnam Electro-Technical Equipment Corporation
VEIC	Vietnam Electronics and Informatics Corporation
VILAS	Vietnam National Accreditation Scheme
VINACEGLASS	Industrial Ceramic and Glass Corporation
VINATEST	Association of Testing Laboratories
VINATEX	Vietnam National Textile and Garment Corporation
VMI	Vietnam Metrology Institute
VPC	Vietnam Productivity Center
VQA	Vietnam Quality Award
VSC	Vietnam Steel Corporation
VSI	Vietnam Standards Institute

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Part I: Introduction

1 Background, Objective, and Scope of the Study

1.1 Background and Objective of the Study

The present study is primarily designed to develop a master plan in the areas of industrial standardization, metrology, testing and quality control (referred to as SMTQ, or "industrial standardization and related activities"), including improvement proposals for "regulatory systems", "human resource development", "organization and systems", and "facilities and equipment".

Since adoption of the Doi Moi (policy renewal process) in 1986, Viet Nam has successfully transformed itself from a former centrally planned economy, which had been adopted for many years, to an emerging economy having a market mechanism, and the economy has been undergoing steady growth. Continuation of the Doi Moi policy has been confirmed in the most recent economic development policy and plan, which was adopted at the VIIIth National Congress of Communist Party of Viet Nam (CPV) in June 1996. The plan declares that the nation is to make a full-fledged embarkment on industrialization and modernization, and sets forth as long-term economic development targets toward 2020, "to basically become an industrialized nation" and "to boost GDP by 8 - 10 times of that in 1990".

To achieve these targets, the Vietnamese government has adopted the strategy of making most of foreign enterprises and investors as major sources of funds, technology, management skills, and market development, by actively encouraging foreign direct investment (FDI). The economy and industry in Viet Nam has shown a significant development since 1989 because of success of this strategy.

The inducement of foreign direct investment and the promotion of an open economy, however, have created a variety of problems which have increasingly become apparent.

An economy based on open market principles is a prerequisite for success in promotion of foreign direct investment, and Viet Nam has chosen this policy direction. It results in, first of all, a clear deterioration of intra- and inter-industrial linkages due to the industrialization process which is nurtured by relying on imported materials and parts. In fact, many joint ventures operating in the manufacturing sector are confined to assembly work and import almost all of parts and components required. State enterprises also depend heavily on imported materials.

Another challenge is the increasing influence of industrialization in traditional ASEAN member countries, which has reached a significant level and is affecting the industrialization process in Viet Nam which has opened the market. In particular, market opening has spurred massive inflow of imports from neighboring countries, while local enterprises, largely consisting of state enterprises, have not made much progress in improvement of management and are loosing competitiveness. Because state enterprises account for a large portion of the economy, these latter conditions have contributed to a slowdown of the growth rate.

Clearly, local industries are facing the need to make structural changes, from assembly-only to multi-tier structure providing vertical linkage, and from on consignment manufacturing to direct exporting.

It is important to realize that these challenges should not be viewed as mere problems to cope with in keeping with the opening of the economy. Rather, they are major challenges which can turn into opportunities for the country to leverage its open economy on behalf of economic development in the context of the increasingly globalized economic environment as represented by AFTA.

Here, industrial standardization and related activities serve as technological infrastructure to help meet these challenges. They can be viewed as the effective means to strengthen competitiveness of the Vietnamese industries by improving product quality and production efficiency. Nevertheless, most enterprises in Viet Nam have a long way to go to achieve company standardization and quality management; their quality management practices are limited to product inspection. It will take some time before STAMEQ's efforts to promote standardization and related activities produce fruitful results.

Beside the lack of the attitude of being receptive or cooperative in relation to standardization and related activities, most of Vietnamese enterprises, except for a handful of large enterprises, have few pieces of testing equipment. There is also a shortage of metrology and calibration resources for the industrial sector, forcing foreign-affiliated enterprises to use foreign sources for calibration services.

To overcome these difficulties, the Vietnamese government decided to promote systematic development of standardization and related activities, thereby to disseminate standardization and quality management to the industries, while making the country's standardization and related systems internationally acceptable. Thereupon, it requested the Japanese government for assistance in development of master plan for such efforts.

In response, Japan International Cooperation Agency (JICA) sent a preparatory study team to Viet Nam in August 1996, which agreed and signed with the Vietnamese government the Scope of Work which sets forth the scope and contents of the proposed study. Based on the Scope of Work, JICA organized a study team consisting of UNICO International Corp., Japanese Standards Association, and Overseas Merchandise Inspection Co., Ltd., which conducted a field survey and analytic work. This report compiles the result of the study.

1.2 Scope of the Study

The study covered the following activities which were defined in the Scope of Work agreed by the preparatory study team and the Vietnamese government, dated August 2, 1996:

1. To evaluate the present condition and needs of the activities on standardization, metrology, testing and quality management in Viet Nam
2. To review the policies, strategies and social-economic development plans essential for the promotion of standardization, metrology, testing and quality management in Viet Nam
3. To evaluate and identify the problems in the standardization, metrology, testing and quality management in Viet Nam
4. To prepare a master plan in detail for the development of industrial standardization, metrology, testing and quality management in Viet Nam, which will include, among others, the following subjects:
   - 4.1 Recommendation on organization structure of STAMEQ to meet its required functions and tasks
   - 4.2 Recommendation for the development of a technical infrastructure for metrology and testing services
   - 4.3 Recommendation on specific priority projects (standard development, testing, metrology, training and quality management)
   - 4.4 Priority and procedure for the implementation of the projects
   - 4.5 Project justification and viability
5. Recommended implementation plan
   - 5.1 Implementation plan and time schedule
   - 5.2 Appropriate organizational and administrative arrangements
6. Conclusion and recommendations

Major subjects of the study are as follows.

(1) Study areas

Industrial standardization, metrology, testing, and quality control "Metrology" is limited to the area which is closely associated with industrial standardization, with focus on maintenance of precision levels of measurement, calibration, and inspection equipment, which is related to metrology, testing and inspection; legal metrology is not included."

(2) Sectors for study

1) Major industrial subsectors for survey

- Machinery subsector (with special emphasis on industrial processing machines)
- Electrical equipment and components subsector, and electronic equipment and components subsector
- Metalworking industry

2) Secondary industrial subsectors for survey

- Textile industry
- Construction materials
- Petroleum industry products

(3) Geographical areas for study

Hanoi, Ho Chi Minh City, and peripheral areas of these cities

2 Outline of the Study and Organization of the Report

2.1 Organization of the Study

The study consists of the following five economic and technical study components. The master plan was formulated on the basis of analysis of data and information collected for these fields of study components.

1) Macroeconomic and sectoral study of the subsectors selected for the study
2) Study on manufactures of the sub sectors selected for the study
3) Study on the existing systems and organizations related to industrial standardization
4) Study on systems, resources, and organizations of metrology and calibration, testing and inspection related to industrial standardization
5) Study on quality management promotion system

(1) Macroeconomic and sectoral study of the subsectors selected for the study

1) Purpose

To identify the current state of economic and industrial development from the macroeconomic viewpoint, and collect data and information required for understanding general profiles of the subsectors and for economic evaluation of the master plan.

2) Methodology and study items

Development plans and strategies, and macroeconomic conditions, were studied primarily on the basis of source materials, statistics and other literature, with some supplemental investigation at relevant organizations. For this purpose, data collection and analysis was conducted prior to the local survey. Study items included: 1) economic development plans and policies, and macroeconomic performance; and 2) the current state of industrial development, industrial development strategy, and characteristics related to industrial structure. The overall picture of the subsectors was obtained by visiting and interviewing General Corporations and leading enterprises.

(2) Individual-enterprise studies of the sectors selected for the study

1) Purpose

a) To understand the current state of quality control practice in individual enterprises;
b) To check the effectiveness of quality control promotion policy at the national level;
c) To understand the current use of certification systems and standards in actual production activity and commercial transactions, as well as the current state of

internal standardization, and identify the need for standardization;

d) To identify the current state of testing, inspection, and calibration services, examine the needs for testing and inspection by external organizations, and check the effectiveness of the calibration system; and

e) To collect data required for measuring the effect of the master plan when implemented.

2) Methodology and study items

For the sectoral-level survey, General Corporations and leading enterprises were surveyed by interviewing representatives. Then, the individual enterprise survey was conducted by using a questionnaire which was distributed to and collected from the selected enterprises, followed by visiting them to identify general profiles and ascertain actual operations. The breakdown of enterprises visited, by industry and region, is shown below.

Number of Manufacturers

Industry / Organization	North	South	Total
Machinery	19	12	31
Metal Working	22	9	31
Electrical & Electronics	22	13	35
Textile & Garment	6	5	11
Construction Materials	2	3	5
Petroleum Products	2	3	5
Sub-Total	73	45	118

The questionnaire was sent to around 800 enterprises from STAMEQ, and 135 responded. The follow-up survey on individual enterprises was conducted when individual enterprises were visited.

(3) Study on the existing systems and organizations related to industrial standardization

1) Objective

To study the current state of standards, the standards development system, certification and accreditation systems, and identify the issues related to the development of the industrial standardization promotion system.

2) Methodology and study items

The interview survey was conducted to identify the current state of STAMEQ and its subordinate organizations, and in particular to study the general outline of standards, standards development, certification, and accreditation programs, legal and institutional framework, the enforcement system, operation and management, accreditation and certification processes, standardization-related education and training systems. In addition, government policy for future deployment of relevant projects and programs was confirmed. Also, the current state of industrial standardization at production sites was investigated during the visit to individual enterprises.

(4) Study on metrology and calibration systems, resources, and organizations related to testing, verification, and industrial standardization

1) Objective

To study the current state of institutional setup and resources related to testing and inspection to see if they are suitable for future needs arising in relation to industrial development. Also, to study testing and inspection bodies which support the certification system, and metrology and calibration bodies which promote industrial standardization, in terms of legal and institutional framework, facilities and equipment, manpower, testing and metrology processes, related education and training systems, and then to identify the issues related to promotion of standardization and related activities, and device improvement measures.

2) Methodology and study items

The interview survey was conducted to identify the current state of STAMEQ and its subordinate organizations, together with the study to check the current progress of standardization in individual enterprises, and the detailed survey for testing and inspection bodies.

The detailed survey was conducted at VMI, QUATEST 1, QUATEST 3, SMQ (Hanoi, Hai Phong, Ho Chi Minh City, and Sate of Dong Nai), universities (Hanoi University of Technology and Ho Chi Minh City University of Technology), and INST (Institute of Nuclear Science and Technique).

(5) Study on quality control promotion system

1) Objective

To identify the current ability and activity of organizations engaged in quality control promotion in Viet Nam, and analyze and examine the features of the principal promotional body which are required in the country and the desirable role of the

institution.

2) Methodology and study items

Organizations and systems related to promotion of quality control were studied to check the current state of the overall promotion system in the country. Also, quality control practice of the individual sectors and enterprises was observed during the questionnaire and visiting surveys to identify the institutional issues viewed from the industry side.

2.2 Field Survey

In the course of the study, three field surveys were conducted, besides the presentation and discussion of the draft final report in Viet Nam.

(1) First field survey

The first field survey was conducted for around two weeks in March 1997 to study the existing systems and issues. Major activities are summarized as follows:

1) To study the current system, legal framework, organization, and operation in the areas of standardization and related activities, and identify the current issues;
2) Macroeconomic and sectoral study by means of interview surveys at related government authorities and leading enterprises as well as data collection and analysis;
3) To identify the current state of metrology and inspection bodies; and
4) Preparation for the questionnaire survey for individual enterprises.

(2) Second field survey

The second field survey was conducted for about one month and half, starting at the end of May 1997 to study the current state of selected enterprises and conduct a detailed survey for metrology and inspection bodies. Major activities are summarized as follows:

1) Visiting survey for selected enterprises to identify the current state of quality control and standardization
2) Detailed survey for metrology and inspection bodies
3) Supplemental survey on the institutional setup and system related to industrial standardization and related activities

(3) Third field survey

The third field survey was conducted for 12 days starting on August 19, to discuss with the counterparts the individual improvement measures and the framework of the master plan, followed by the supplemental survey for finalization of the master plan.

(4) Presentation and discussion on the draft final report

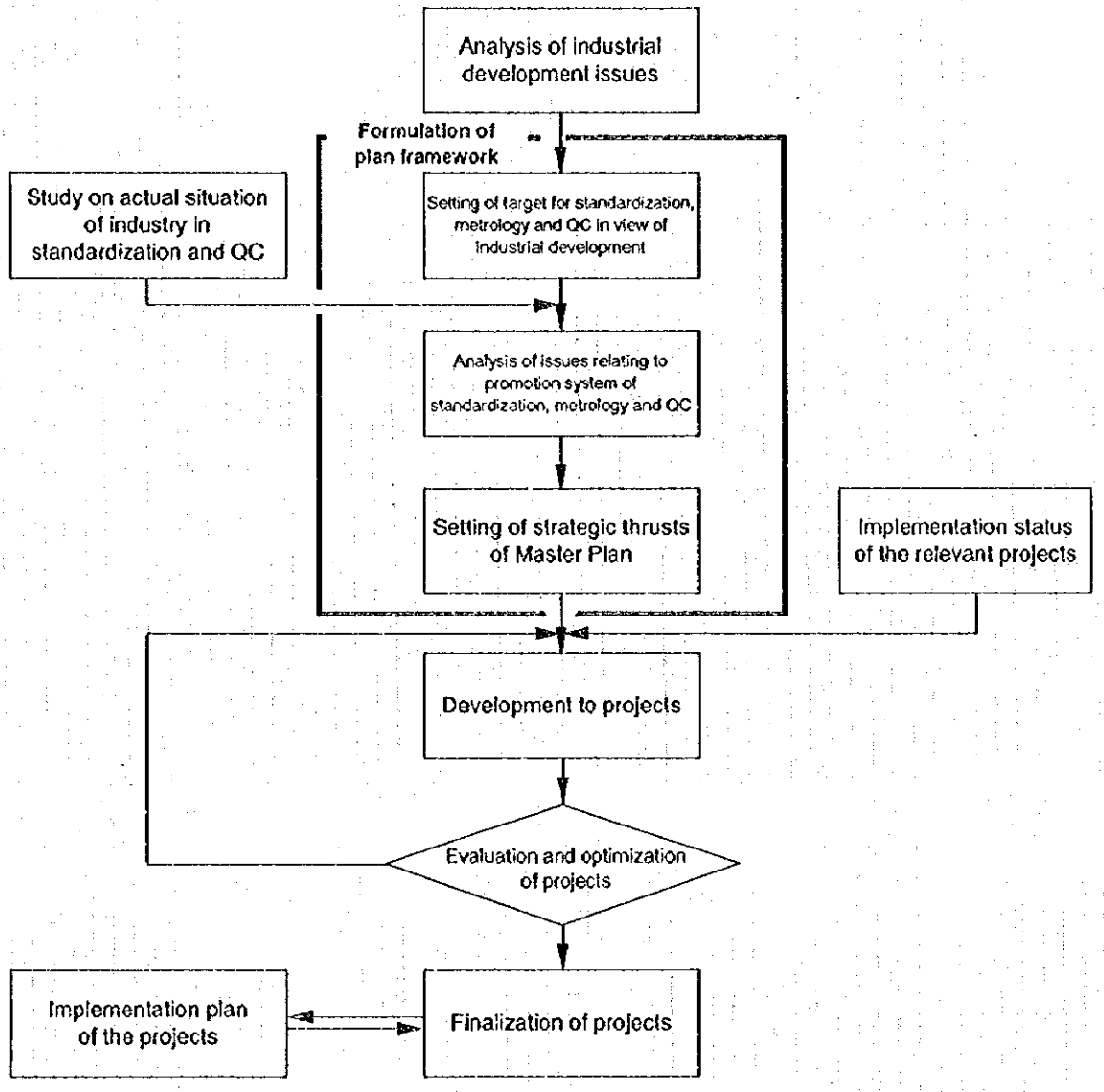
Presentation and discussion on the draft final report was conducted for 10 days, starting on December 1. Together with presentation, a seminar was held to promote the master plan by making its intent and expected effect known to related government organizations and enterprises.

2.3 Organization of the Final Report

The final report will compile all the results of the study, including those discussed in Interim Reports I and II. The current draft final report is organized as follows.

The report consists of "Summary" and "Main Report." The Main Report consists of four parts, "Introduction," "Analysis of Current State," "Master Plan," and "Analysis of Subsectors," followed by "Annexes." Part I will briefly describe and discuss the objective and background of the study, and the process of the study. Part II will analyze the current state of: 1) economic and industrial development, and industrial sector; and 2) the institutional setup and system in the areas of industrial standardization and related activities. Part III will establish planning targets, discuss major issues in each area of standardization and related activities, and recommend improvement and development measures. It also recommends projects which should be implemented by joint efforts of related organizations, with a specific due target. The general work flow in study and analysis up to the recommendation of the master plan is shown in Figure 2-1. Part IV will analyze the current state of standardization and quality control in the subsectors selected for the study, and recommend promotional measures for each subsector. Finally, the annexes will contain materials related to the analysis in Parts I through III.

Figure 2-1 Outline of Planning Process



Part II: Understanding of Current Situation

1 Current Analysis - Present State of Industrial Development and Development Strategy

1.1 Economic Development and Industrial Sector in Viet Nam

1.1.1 Economic and Industrial development policies[1] and past results

(1) Economic and industrial development policies

The basic direction of the current economic policy of the Vietnamese government is best described by "Doi Moi (renovation)" policy which was adopted at the Sixth National Congress of Communist Party of Viet Nam in 1986. It should be noted that the Doi Moi Policy extends beyond economic reform. It embraces a broad sense of renovation (reform) including politics, society, and foreign relations.

The policy is based on the following strategies, of which the core element constitutes a drastic shift of economic policy, which is defined as "transformation of economic management from a centrally planned economy to an economy using a market mechanism"[2] :

1) To increase production of food, consumer goods, and export items, with a particular emphasis on development of agriculture;
2) To focus on selected subsectors of heavy industries which contribute to the above objective and national defense (mainly raw materials, energy, and machinery);
3) To encourage economic reform by introducing various market mechanisms, including private enterprises; and
4) To promote international division of labor and international cooperation.

Under the Doi Moi policy, the highest priority is given to stabilization of macroeconomic conditions and the development of the industrial sector. As the macroeconomic goal was basically achieved by the end of 1993, the "industrialization and modernization" line was put on the agenda at the Party National Conference in January 1994. Then, in July, the Central Committee Plenary sessions adopted a resolution to set forth industrial development strategies.

Policy elements which have significant bearing on industrial development are summarized as follows:

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1 Industrial development has significant weight in Viet Nam's economic development, and both are discussed here together to avoid duplication.

2 Doi Moi is a policy line chosen to achieve the socialism's final goal and does not mean conversion to capitalism.

1) Shift of investment priority from heavy industries to agriculture, forestry, fisheries, and related processing industries, industries manufacturing consumer goods and export products.
2) To increase investment by boosting domestic savings by means of a) mobilization of public savings, and b) reduction of government budget deficits. These are manifested as the encouragement of private business activities in urban and rural areas, and modernization, privatization, and conversion to joint stock companies of state enterprises.
3) Notable relaxation of restrictions on foreign direct investment (FDI) in the country under the new Foreign Investment Act of 1988, which authorizes FDI in wide areas and attempts to induce it by offering various incentives.

The most recent economic development policy and plan was adopted at the Eighth National Congress of the Communist Party of Viet Nam in June 1996. It sets forth economic and social development goals toward 2020, and proposes economic development strategies for 1996 - 2000 along the line thereof (development targets and strategies in the industrial sector are discussed later).

Economic development strategies first declare the continuation of the Doi Moi policy and full commitment to the industrialization and modernization line. More precisely, two long-term economic development targets for 2020 are clearly stated; 1) the country will "basically become an industrialized country" by 2020; and 2) GDP will increase by 8-10 times over that in 1990.

It is important to note that previous goals, as shown in economic indicators to be achieved by 2000 (Table 1-1), have been adjusted upward. This is considered to reflect the country's determination to further pursue high economic growth, and rapid industrialization and modernization of the industrial sector are strongly advocated.

To accomplish "development focusing on industrialization and modernization, and conversion of industrial structure," two strategies are reiterated: 1) accelerated modernization of critical areas and construction of selected large-scale projects, and 2) a concentration on accelerated development of selected industrial sectors, including agriculture, forestry, and fisheries, petroleum exploration and refining, machine manufacturing, electronics, telecommunications, and tourism. Also, two new strategies are emphasized: 3) to raise the saving rate; and 4) dynamic development in the areas of education and training, and science and technology.

These aggressive strategies seem to have gained momentum from healthy economic performance and growth in the late 1980s and the early 1990s. During the period, the country basically achieved self-sufficiency in food supply and started grain exports. In

the secondary and tertiary industries, improvement has been made in the following three areas: 1) refocused development of economic infrastructure which had been neglected under the centrally planned economy; 2) the start of crude oil production in the 1980s; and 3) increased efforts to foster the service industry.

On the other hand, the economic development strategies call forth, in addition to positive aspects of recent development initiatives, the need for coping with various issues which have surfaced in the process of introducing the market mechanism and accelerating economic development.

Special emphasis is placed on concurrent promotion of industrialization and development of agricultural and rural sectors, as well as correction of various disparities which typically emerge at the initial stage of economic development.

It is clearly pointed out that the market economy has spurred malicious acts in society, including corruption, illegal trade, wasteful consumption, gambling, drug abuse, and prostitution, and the widening gap between rich and poor (in terms of disparity between generations, between regions, between urban and rural areas, and between ethnic groups). In particular, industrial development policy is increasingly expected to play an effective role in reducing such disparities, and voices have been raised emphasizing the need for equalized development of different regions.

(2) Current level of economy and economic growth trend

To illustrate how the Vietnamese economy has been performing under the recent economic policy, Table 1-2 shows the country's macroeconomic indicators compared to those in neighboring countries.

1) GDP[3] and sectoral composition

Recent trends in GDP and sectoral composition are shown in Tables 1-3 through 1-6. In 1995, agriculture accounted for 27.5% of nominal GDP, manufacturing 30.1%[4] and service 42.4%. Compared to the 1991 composition of 40.5%, 23.8%, and 35.7%, respectively, industrialization has steadily progressed. Nevertheless, the agriculture sector still maintains a relatively high share, which is one of distinctive characteristics seen in the early stage of industrialization in developing countries.

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[3] Traditionally, the country's national income accounting adopted Material Product System (MPS) of the former USSR. The System of National Accounts (SNA) has been used since 1992. Statistical resources have not yet been fully developed and consistent data are not always available.

[4] Including the manufacturing and construction industries.

2) GDP growth rate

The economy entered a recovery path after the adoption of the Doi Moi policy in 1986, and real GDP grew at the average annual rate of 7.3% between 1988 and 1995. The growth rate in 1995 and 1996 is estimated at 9.5%.

3) GDP per capita

In the mid-1990s, GDP per capita was US$273.

(3) External economic affairs

The country's external trade has been centrally controlled by the National Planning Committee up to the latter 1980s or before the Doi Moi policy was introduced. In fact, foreign trade has been solely handled by a designated state enterprise (Export and Import Corporation).

Trade partners were mostly COMECON countries consisting of the former USSR and Eastern Europe. The country imported fuels and raw materials from the former USSR at "favorable" rates which were set below international prices, which it exported industrial products COMECON countries. As exports were guaranteed to be accepted by these importing countries, quality was not much questioned. More importantly, the country depended on the former USSR for supply of strategic goods, including oil, iron and steel, and chemical fertilizer, resulting in a large trade deficit, most which was covered by the Soviet government's loans.

In the late 1980s, political and economic turmoil in the former USSR and Eastern Europe caused Viet Nam's trade with these countries to plummet, and its trade partners shifted to the Western countries in the early 1990s.

Since then, the country's foreign trade has been growing rapidly, but imports expanded faster than exports, causing a trade deficit to accumulate (Table 1-7). Major import items are fuels, raw materials, and intermediate and capital goods including plants and machinery (Table 1-8). Clearly, import growth reflects increasing foreign direct investment. In addition, imports of consumer goods are on the rise due to income growth.

Major export items are crude oil, textile and clothing, and fishery products (Table 1-9).

Japan is the largest importer of Vietnamese products, accounting for 26.1% of total (1994), followed by Singapore 8.7%, and Germany 8.0%. U.S.-bound exports expanded sharply after the normalization of diplomatic relations in 1995, representing a 3.8% share.

Singapore is the largest exporter to the country, accounting for 17.0% (1994), followed by South Korea 13.1% and Taiwan 9.5%.

Because of increase in the deficit of the trade balance since 1993, a deficit has been accumulated in the current account of the balance of payments, most of which has been offset by the inflow of foreign direct investment as well as development aids by foreign countries and international organizations.

The opening of the domestic economy which was previously sheltered from international competition has caused the economy to face a number of problems including:

1) Expansion of the trade deficit as well as the current account deficit;
2) Increased smuggling of goods into the country which adversely affects domestic industries and create potential tax loss;
3) Dependence on primary goods for export (with exposure to fluctuation of international prices);
4) Influence of participation of AFTA on domestic industries and tax revenues (member countries are required to lower tariff rates for industrial products imported and exported within the ASEAN region to 5% or below by 2006); and
5) Obstacles to trade growth due to complicated import and export procedures, frequent changes in regulations and procedures, and the lack of statistical data and systematic collection.

(4) Foreign direct investment

Significant liberalization of FDI under the Doi Moi policy and incentives to encourage it have resulted in rapid expansion of direct investment in the country (Table 1-10), which is considered to be a major engine for high economic growth in recent years. The value of foreign direct investment approved annually grew at the average of 50.7% between 1991 and 1995. In particular, it soared 73.4% in 1995 to US$56,531 million, which was approximately 30% more than foreign investment approved in Malaysia and 3.5 times that in the Philippines.

Major factors for sustaining the rapid pace include the fast-growing domestic economy, high prospect for abundant natural resources, a large potential market, and the proximity to Southeast Asian countries which continue high growth. The cumulative total of FDI approved up to 1995 reached US$18.4 billion. Top five countries are all in East and Southeast Asia (Table 1-11).

Major sectors receiving FDI are the hotel/tourism and service industries, each of which accounts for approximately 18% of total (based on the value formally approved), followed by the heavy industry 16% and the light industry 14% (Table 1-12).

(5) Government finance

The government budget deficit as a percentage of GDP reached around 7% on average between FY1984 and FY1990. Then, with a drastic cutback in spending, including reduced subsidies to state enterprises, and increased revenues resulting from tax reforms, it dropped to 2.9% on average between 1991 and 1995 (Table 1-13).

At present, the second round of tax reform is under way and will increase revenues, while the government is strongly committed to a further cutback in expenditures.

The largest source of government revenues is income from state enterprises, which consists of profits and depreciation expenses. Between 1989 and 1995, revenues from state enterprises accounted for an average of 55.2% of total government revenues, equivalent to 10.1% of GDP. The second largest source is oil, representing 14.8% of the total during the same period.

While non-tax revenues accounted for major portions (72.1% in 1990), their share dropped to 13% in 1995 as the form of collection from state enterprises was changed to tax. Under the ongoing second tax reform, the government plans to expand tax coverage by introducing a value added tax (VAT), which is expected to increase the importance of tax as a major revenue source.

Government expenditures to state enterprises, on the other hand, contracted sharply from 7.9% of GDP in 1987 to 0.5% in 1994, as a result of considerable cutbacks in subsidies since 1989, consolidation of inefficient or inactive state enterprises, and reduction of employment. At the same time, the government's contribution to capital formation of state enterprises was terminated in 1992; it was replaced with bank loans, contributing greatly to reduction of the government's financial burden.

Nevertheless, government expenditures as a whole have been remaining mostly unchanged as public investment to build infrastructure has been rising rapidly.

(6) Finance

The country's financial system is fettered by a serious problem, the lack of a mechanism to mobilize domestic funds. More precisely, major issues related to the financial system, which are considered to affect industrial development directly, are as follows.

1) Low saving ratio

The saving ratio in Viet Nam is relatively low, which constitutes a partial cause for

the current account deficit (Table 1-14). Major factors are low income and a low level of motivation for personal savings under the centrally planned economy. At present, people prefer physical assets such as gold, or U.S. dollars, to financial assets, with effect of considerably restricting mobilization of domestic funds.

2) Massive default and bad loans of state enterprises

Large amounts of loans to state enterprises are in default (accounting for more than 60% of default and bad loans), adversely affecting bank management and the healthy development of the financial system as a whole.

3) Undeveloped financial and capital markets, and financial policy measures

The stock market has not opened, and policy measures to control money supply are limited to the credit line ceiling for each bank and control of interest rates. There is no means of using the market mechanism.

1.1.2 Positioning of the industrial sector in economic development

(1) Performance of the industrial sector

The Vietnamese economy is in transition from a centrally planned system to a market system, while it is classified as a low-income developing economy. In addition, its development process was hindered over three decades due to the war, until the unification of North and South in 1976[5].

Despite these handicaps, the industrial sector has been developing steadily under the Doi Moi policy. During the four-year period between 1991 and 1995, GDP (indicated in 1989 prices) showed an annual 8.8% growth, whereas the industrial sector expanded 13.4%. As a result, the sector's share in GDP rose from 19.3% to 22.8% during the period.

Major factors contributing to healthy growth are the strengthening of domestic enterprises by introducing a series of economic liberalizations and the market principle, including price liberalization (excluding strategic products such as iron and steel), liberalization of the trade system, restructuring of state enterprises, and promotion of private business activities.

In the short term, the Doi Moi policy has exposed domestic enterprises to intensive competition with imported goods, while reduction of the subsidies hit many enterprises

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[5] For instance, small factories each having necessary processes and equipment were deliberately dispersed throughout the country to reduce damage by bombing. This resulted in the lack of economy of scale and inefficient industrial location, while increasing the number of state enterprises excessively.

hard. In 1988 and 1989, the industrial sector's growth rate slowed down abruptly. Then it started fast growth in 1990. Compared to the annual average growth rate of 10.8% between 1990 and 1995, the growth rate reached 13.7% in 1995 and around 14% in 1996.

Up to 1990, growth was primarily driven by expanded production in the Bakhoe oil field and strong growth of the electricity and cement sectors. Then, after 1991, rapid growth of enterprises in the manufacturing sector contributed greatly. It was clearly fueled by a series of liberalization policies and the introduction of the market mechanism and competition under the Doi Moi policy. Also, the inducement of foreign direct investment appeared to play an important role. The liberalization policy first brought rapid slowdowns in economic growth in 1988 and 1989 due to resultant competition with imported products together with the cutbacks in government subsidies[6], followed by strong growth in 1990 and onwards.

(2) Government investment plan in the industrial sector, as seen in the party's official report

The positioning of the industrial sector in the country's future economic development is clearly seen in the government's investment plan contained in the five-year plan for 1996-2000. Here, the industrial sector is considered as a major engine for the future industrialization and modernization droves. This is reflected in public investment in the sector, which accounts for the largest share of the development budget, 43%.

Within the industrial sector, heavy industries have a dominant 70% share, while industries related to consumer goods and export products receive only 30% of allocation.

Table 1-15 shows production targets for key industrial products. Note than the production targets are set forth for a limited number of items.

The plan also emphasizes, in connection with the agriculture and rural area development program[7], the development of industrial crop and livestock farming, the recovery of forestry resources, and industrialization of agriculture and rural area.

From the viewpoint of correcting the shortcomings of the new economic development policy, as discussed earlier, balanced development of regions is also emphasized by

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[6] Also, the subsidy to enterprises was reduced.

[7] The economic report lists eleven programs as key development areas and programs in the 1996-2000 economic development strategy, including "agriculture and rural area development," "industrial development," "infrastructure development," "science and technology development, and ecology and environment preservation," "development of service economy," "external economic development," and "education and training development."

encouraging development of areas other than the traditional three key economic zones[8].

1.1.3 Structure of the industrial sector and major characteristics

(1) General

The cadre of the industrial sector in the country is formed by groups of state enterprises which are controlled by the central government. In addition, there are state enterprises which are engaged in manufacturing activity under the supervision of regional people's committees (local government) and military forces. These state enterprises mostly act as local partners in industrial projects where foreign direct investment is involved.

Private enterprises are encouraged and a large number of them have been established. Nevertheless, they are all relatively small and are concentrated in the services sector, while the industrial sector is limited to apparel and plastics processing.

Geographically, industrial development is concentrated in the three key economic zones, particularly those in the north and south.

(2) State enterprises, joint ventures, and private enterprises

State enterprises have a critical position in the Vietnamese economy. Their total output accounted for 29.6% of GDP in 1994. Their share is much larger in the industrial sector, 65.7% as of 1994.

State enterprises are controlled by various government entities, the central government, regional people's committees (local government), and the military. State enterprises under the central government are grouped under general corporations, each of which is responsible for a certain subsector[9]. They are expected to conduct corporate activities under the unified policy. Most of the general corporations are under the Ministry of Industry, while some manufacturing enterprises are controlled by the Ministry of Construction or the Ministry of Transportation.

Among state enterprises under regional people's committees (local government), those in Hanoi and Ho Chi Minh City are very active.

In most joint ventures with foreign companies, state enterprises act as local partners.

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[8] According to the resolution of the Seventh Central Committee Plenary Session of CPV, the three key economic zones are: Hanoi, Hai Phong, and Quang Ninh in the north; Hue, Da Nang, and Niachang in the center; and Ho Chi Minh City, Bien Hoa, and Vung Thau in the south. The plan, however, sets forth that: 1) the inducement of heavy industries is limited to Bien Hoe and Quang Nguay where the petroleum refining industry will be located, while fostering the industries manufacturing consumer goods and export products; and 2) accelerated development of small- and medium-sized industrial estates in regions other than the three key economic zones. Furthermore, the list seems to be extended by adding other cities in the three key economic zones.

[9] State enterprises under the Ministry of Industry are grouped under 14 general corporations.

Table 1-16 lists state enterprises in the machinery, metalworking, and electric/electronic industries, which are the subject of this study, and general corporations controlling them. These enterprises are leaders in each of the subsectors.

The state enterprises are expected to play a key role in future industrial development on a continuous basis. They are generally large or medium-sized, with high levels of technology and efficient management. They are expected, as they did in the past, to deal with rapid economic development and social problems accompanying it by assuming a leadership position among other sectors (e.g., cooperatives and the private sector).

Recently, however, the slowdown of state enterprises in the industrial sector has been reported[10]. In the first quarter of 1997, the industrial sector grew 14% over the previous year to meet the growth target, but the pace slowed down to 13.8% in April and 13.7% in May. In particular, the growth rate in May was 11.4%. While foreign-affiliated enterprises continue to maintain healthy growth, state enterprises under the Ministry of Industry (not including their joint ventures with foreign companies) recorded a meager 9.2% growth. The shortage of investment is cited as the major factor for this slowdown.

The need for correction of various problems related to state enterprises has been pointed out in the political report of the recent general meeting of the Communist Party. The problems are summarized as follows:

1) Unsuccessful attempt to reform the state-owned sectors. The report recommends promotion of "joint-stock ownership" to improve economic efficiency[11].
2) Lack of adequate control on foreign investment. The report proposes increased capital contribution by local partners in joint ventures with foreign companies, with an emphasis on the country's interests as well as interests of foreign investors.

(3) Foreign direct investment

This investment actively encouraged by the government, serves as a major driving force for industrial development. In most cases, local partners in foreign-affiliated joint ventures are state enterprises under the central and local governments[12]. Although the competition of foreign investment disaggregated by subsector is not available, it is known that diverse industries are the subject of investment. Among them, an emphasis is placed on industries which meet basic needs, such as power, iron and steel, and cement,

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10 An article of *Viet Nam News* on June 20, 1997, quoted from an article of *Thanh Nien* (Youth).

11 "Economic Report" states that promotion of joint-stock company does not necessarily mean privatization.

12 The February 1997 edition of *Viet Nam Economic Review* reports that state enterprises participate in 96% of alliances and joint ventures with foreign companies, contributing 99% of investment as local partners (see page 15).

and those which supply products to the export market as well as the domestic market, such as textiles and clothing, and electrical and electronic equipment.

In terms of production process, most industrial projects are limited to the assembly of imported parts and materials. Generally, joint ventures are not deeply involved in improvement of production technology of their local partners, which are also mainly interested in securing target profits. Also, joint ventures are not involved in sales and marketing as they manufacture products on a contract basis.

According to a recent survey on direct investment in Viet Nam by Japanese and U.S. companies[13], both Japanese and U.S. companies cited the large domestic market as the primary reason for investment in the country. As the next important reason, U.S. companies cited high return on investment, while Japanese companies emphasized low labor cost and highly skilled workers. Approximately one-third of companies investing in the country are exempted from customs duties, and 33% of Japanese companies and 16% of U.S. companies enjoy other tax incentives. In addition, many companies reportedly receive other incentives.

Other surveys also indicate that Viet Nam is highly regarded by foreign companies as an attractive place of investment. In particular, they show strong interest in the local market with its high growth potential and availability of highly skilled workers. These advantages can still be benefically used, as manufacturing industries in the country expand from assembly operation to the multi-tier structure having a variety of parts supply capacity.

Nevertheless, the current environment has various obstacles to success in further encouraging new investment.

The survey cited above indicates that Japanese and U.S. companies pointed out the following major obstacles: 1) inefficient bureaucratic procedures requiring considerable time and cost; 2) ambiguous laws and regulations, which are frequently amended; 3) arbitrary and undue application of laws and regulations; and 4) land policy.

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[13] Entitled "Foreign Direct Investment in Viet Nam: Policies and Corporate Strategies," and conducted by Associate Professor Mark Mason, School of Management, Yale University, this study was commissioned by the Overseas Investment Research Center of Export and Import Bank of Japan (see pp.56-75 of the research center's monthly report, August 1997).

(4) Non-state sector

The non-state part[14] of the industrial sector accounted for 34.3% of the GDP portion (1994), much lower than agriculture (97.1%) and services (52.9%). It is also behind the state sector in growth rate.

The non-state sector outpaces the state sector in the rate of increase in number of enterprises, largely due to the insufficient ability of the state sector to absorb employment. In the early 1990s, the number of state enterprises halved from around 12,000 to 6,000, and cooperatives declined rapidly, creating a massive flow of labor force to the non-state sector. In other words, the non-state sector expanded with the structural shift of labor from the state sector, rather than privatization of state enterprises, so that another factor of production, capital, still remains in the state sector. Also, as the non-state sector receives less privilege in land utilization than the state sector does, it is not in a favorable position to form joint ventures with foreign companies, in which land use is one of the most important conditions.

Many enterprises in the non-state sector (67%) are family-owned concerns and employ 5 - 300 persons, with capital being estimated at around 100 million - 1 billion Dong (US$9,000 - 90,000). In particular, the amount of capital is very small, approximately 450 Dong/enterprises compared to 12,300 Dong for the average state enterprise (according to the 1995 data).

(5) Small- and medium-sized enterprises[15]

Shares of small- and medium-size enterprises in each form of enterprise operated in the country according to ownership are as follows[16]:

1. Sate enterprises: 85.7%
2. Foreign joint ventures: 30%
3. Cooperatives, private enterprises, limited companies, joint-stock companies: 100%

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[14] As joint ventures with foreign capital are mostly formed with state enterprises, they are considered as part of the state sector. Joint ventures formed by private capital and those wholly owned by foreign enterprises are classified as the non-state sector.

[15] At present, there is no clear definition of small- and medium-sized enterprises in the country. One definition used by banks in relation to commercial and industrial loans is as follows:
1) Medium-sized enterprises: capital 5-10 billion VND, and employee 500-1,000
2) Small enterprises: capital below 5 billion VND, and employee below 500
In addition, the following is the definition adopted by many researchers, which is also the basis of the analysis here:
1) in the production and construction sector
a) Small: capital below 1 billion VND and employee less than 100
b) Medium: capital 1-10 billion VND and employee 100-500
2) in the commercial and service sectors
-Medium: capital 0.5-5 billion VND and employee 50-250

[16] *VSED*, Winter 1996 (No.8)

It is important to note that small- and medium-size enterprises in the country are not limited to the non-state sector, and there are many among the state enterprises. Measured by the number of establishments, those in the non-state sector account for 78% of total.

Before the start of the Doi Moi policy in 1989, the government promoted the formation of state enterprises, most of which were small- and medium-size enterprises organized in various regions. After 1991, around 2,000 enterprises were dissolved or reorganized so to as to have a different form of ownership, and 4,000 enterprises were merged with other enterprises in the drastic process of reforming state enterprises (total number reduced from 12,300 to 6,300). In particular, state enterprises, which were operated at the local level and had 100 or less employees or capital of 500 million Dong or less, were forced to terminate operation or could not find work for a long period of time.

Through these processes, small- and medium-size enterprises in the state sector increased in size, and their product lines were modified to meet the market needs, while their management was improved. At the same time, their number was significantly reduced.

In contrast, small- and medium-sized enterprises in the private sector have been growing in number and play an increasingly important role in the economic development process.

According to the available data on distribution of small- and medium-sized enterprises in the HCMC area by subsector, most of them are engaged in production of food and general merchandise. At the same time, new enterprises such as plastics processing are emerging, although they are not likely to form the seeds of the future supporting industries expected in the industrialization process.

1.1.4 Regional distribution of industrial development

The government has designated three strategic economic development zones, one each in the north, the center, and the south.

Direct investment by foreign capital is concentrated in the three zones (accounting for 84% of total[17]). On the other hand, government investment intends to ensure balanced development among regions, including mountain areas, seemingly making a fair allocation

[17] *Viet Nam Economic Review* February 1997, P.15

on a provincial basis.

Figures 1-1 through 1-3 show conceptual views of the three strategic economic development zones, and the triangle zones in the north and the south. Figures 1-4 and 1-5 show the distribution of industrial estates in Hanoi and the southern triangle zone.

1.2 Recent Key Issues Related to Development

At present, one of the strongly recognized issues related to economic and industrial development in the country is the participation in the ASEAN Free Trade Area (AFTA). One of the key policy vehicles in AFTA is common effective preferential treatment (CEPT) under which import tariffs are set in the range between 0 - 5% for 32,000 items of 15 industrial product groups[18] as agreed by the signatories. At the 1992 ASEAN summit meeting, it was proposed to fully implement AFTA within fifteen years, but and later it was agreed to reduce the period to ten years. Viet Nam, as a new member, is granted three more years.

While participation in AFTA will cause the country's import tariff revenues to decrease US$2-3 million, it will create a sizable potential export market, which should be fully exploited if preparation can be made properly.

Meanwhile, voices are being raised to demand various changes in the previous industrial development process under the Doi Moi policy, including the following aspects:

1) Production using foreign direct investment is concentrated in assembly-type industries such as textiles and apparel, electrical and electronic equipment, and leather and shoes, and is generally carried out on a contract basis. Needless to say, contract production is unfavorable for producers in terms of price and profitability. While Vietnamese industries can enjoy many benefits from foreign partners who provide capital, market, design, technology, and raw materials and parts, they should not rely solely on the relationship and should develop the ability to export their own products directly.
2) It is important to induce foreign direct investment in export-oriented areas. In particular, local production of automotive and motorcycle parts as well as electronic parts and components should be encouraged to develop supporting industries for these products, enabling gradual participation in the industrial cooperation program among ASEAN countries[19].

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[18] Among the subsectors under the study, cement, textile, and electronic products are included.

[19] Opinion of MPI Deputy Minister as quoted on the June 9, 1997 edition of *Saigon Times*

3) In the electronics and information technology industries, direct foreign investment is limited to assembly of some parts and components as well as household electronic equipment, and has not served as a seed for development of the high-tech industry. In future, priority should not be given to mere assembly of electronic products.

The need for reinforcement of the industrial base is also pointed out in consideration to the imminent participation in AFTA. Under present conditions, Vietnamese industries will likely face strong competition from products which will be imported from neighboring countries under the new customs union. Production facilities and equipment in the country are 20-50 years behind the present world level. Factories are characterized by high levels of per-unit consumption of energies and raw materials, including electricity, and low productivity. Quality control is at the very early level, and productivity is said to be 25%-30% of the world level, except for some industries. In addition, the need for better packaging, pricing policy, and after-sales service is pointed out[20].

Also pointed out is the obsoleteness of technology and equipment imported. Voices are being raised to demand the prohibition of old technology from being imported into the country. This is true in some cases (particularly equipment bought by small- and medium-sized state enterprises under the control of local governments). However, it is also true that the importation of old equipment often helps Vietnamese industries to reinforce competitiveness. Thus, the decision on the import of old equipment should be made on the basis of the market principle, i.e., it is the matter of whether the equipment is worth the price.

1.3 Major Issues Related to Development of the Subsectors under the Study

1.3.1 Electrical and electronic equipment industry

Current state of development

The traditional electrical and electronic equipment industry has grown around the electrical machinery sector, such as transformers and motors. Consumer products have been limited to electrical fans, dry batteries, and lamps. In the south, electronic production has been carried out at factories owned by foreign companies before liberalization, including radio and black-and-white TVs.

[20] A paper of MOI Vice Minister Le Quoc Khanh published on Viet Nam News, May 25, 1997

Then, as foreign direct investment is induced under the Doi Moi policy, production of color TVs and other electronic equipment as well as integrating watt-hour meters has been started. Yet these production activities are limited to assembly operation using imported parts and components, and have not fostered local parts manufactures. Also, many products made by joint ventures are exported, but they rely entirely on sales channels of foreign partners, and are rarely exported under their own brands.

In the electrical machinery industry, products remain very old as no design change has been made for a long period of time. Although foreign technology has recently been introduced for battery and other production, it is not necessarily the latest to meet market needs.

Electric fans, dry batteries, and color TVs face fierce competition from imported products, the bulk of which is smuggled, and the electrical and electronic equipment industry is losing share partly due to the lack of competitiveness, as evidenced in low capacity utilization of the state enterprises that are without foreign partners.

Development scenario and issues related to development strategy

At present, the Vietnamese government is pursuing the strategy of expanding the electrical and electronic subsector by encouraging foreign direct investment, which produces successful results as the first stage. Production in the subsector has been steadily growing, and exports are on the rise although most of them are accomplished by joint ventures.

Now, further development is expected to proceed in the following steps:

1) Product diversification
2) Local procurement of raw materials and parts
3) Local design capabilities focused on model change

Nevertheless, local resources required to initiate these steps are apparently lacking in all the areas, i.e., funds, technology, management and marketing know-how, human resources, and infrastructure.

The feasible development strategy is to fill the resource gap by using foreign direct investment. Under this scenario, much effort is required on the Vietnamese side in the following areas:

1) The development of human resources including the creation of the human-element foundation for absorbing technology and management know-how to be transferred from foreign partners
2) The building of technology infrastructure to reduce the burdens imposed on foreign partners in starting operations in the country.

In the areas of standardization and quality control, the first requirement) above is translated to education of engineers and managers who have basic knowledge of internal standardization and quality control, and engineers and technicians who have testing and inspection skills. On the other hand, the second requirement) is translated to the improvement of testing and calibration services. In future, local production of parts and components, design techniques, metalworking, attain higher precision levels, and prototype production will become major focal points.

Meanwhile, the current development strategy has potential problems.

At present, foreign investment is concentrated in assembly operation. The likely development scenario beyond this stage is to attract key parts suppliers and encourage assembly manufacturers to increase local content, while fostering local enterprises which can supply materials and parts to the primary parts suppliers.

The prerequisite to the scenario is growth of assembly makers operating in the country by expanding supply to domestic and export markets. When production by the assembly makers reaches critical mass, they can expect investment by key parts suppliers, which in turn helps strengthen competitiveness of the assembly makers.

Such efforts to strengthen the assembly makers can be attenuated, however, if the government pursues hasty localization policy by restricting imports of parts or modifying criteria for CKD and SKD licensing. It is important to realize that industrial development cannot be effectively promoted by manipulation of tariff rates. Rather it must be driven by competition under the market mechanism, letting individual enterprises decide on their own management and marketing strategies. This will spur broad-based and resilient industrial development, including the fostering of subsectors which constitute the rigid industrial structure. While letting the market and private initiative work, the government is executed to secure a level playing field for local products with imports by keeping product smuggling in check.

1.3.2 Machinery and metalworking industries

Current state of development

The machinery industry in Viet Nam supplies products to a wide variety of industries including agriculture, forestry, cement, fertilizer, pulp and paper, sugar refining, mining, port and harbor service, shipping, construction, textile and fabrics, and sewing. Most of customers are state enterprises.

On the other hand, industries requiring multi-tiered parts suppliers, such as the electrical and electronic industry and the auto industry, have just emerged. They import

most of the parts and components that they assemble.

While some foreign-affiliated joint ventures have acquired new equipment (and thus new technology), state enterprises use equipment which is mostly old and inefficient, and does not meet precision requirements. To manufacture products which can compete in the international market, they must renew these old machinery and equipment.

The metalworking subsector is dominantly operated as part of metal and machinery manufacturers, except for a limited number of foundries. These shops use old equipment and obsolete technology. The lack of proper quality control results in high rejection rates. As a result, they supply products for captive consumption or the traditional machinery industry which does not have strict requirements for strength or precision. Foundries supply other enterprises in the same group (under control of the same general corporation). These shops are not very active, reflecting the low operating rate of the machinery industry.

Compared to the metal and machinery industries, joint ventures with foreign companies are seldom seen in the metalworking industry. At present, foreign enterprises and joint ventures in the subsector, which operate in the country, are classified as follows: 1) wholly owned subsidiaries of foreign companies, which produced standard parts for molds and dies and supply them for captive consumption or export through sales channels of parent companies; and 2) joint ventures which export products (castings) to customers of their partners. Thus, they mostly serve as the overseas production base, and their products are incorporated by foreign manufacturers.

Development scenario and issues related to development strategy

As discussed earlier, the metalworking subsector in the country basically operates as captive shops of machinery manufacturers. For this reason, issues related to the two subsectors are addressed and analyzed as follows.

The machinery industry is generally characterized by small lot production in wide varieties, mostly custom production on a contract basis. In fact, there are many highly skilled workers in the assembly and finishing processes. Nevertheless, given the lack of product modification over a long period of time, the low capacity utilization rate, and a high rejection rate of base materials, the industry is not capable of producing competitive products. Consequently, it has to rely on a small domestic market mainly consisting of state enterprises which also lack competitiveness. There is no opportunity for sales expansion and high capacity utilization on the basis of export promotion and product development. The current conditions including the low operating rate work against competitiveness, which makes it difficult to make new capital investment.

As the metalworking industry is incorporated into the machinery industry, it faces the same problem. In fact, the two subsectors and their problems adversely affect each other to prevent them from being effectively addressed, e.g., the low operating rate of the machinery industry prohibits the upgrading of the metalworking industry, and the use of low quality materials reducts the competitiveness of the machinery subsector.

The workable approach to the problem should start from the reorganization of metalworking shops into independent enterprises. This will bring competition into the mostly captive operation and motivate them to develop new products and materials, while learning new techniques and skills. Also, independent metalworking shops will be forced to realize the need for committed efforts to raise their competitiveness by making continuous improvement in quality, cost, and delivery schedule.

Management in a competitive environment must address the issues facing the machinery making operation. To do so it will prompt enterprises to realize the need for market development, the improvement of materials procured, and the overall improvement of the production sector.

Quality improvement of procured materials alone justifies the separation of metalworking shops as specialized manufacturers. This will allow machinery manufacturers to select supply sources which can meet their requirements for quality, cost, and delivery schedule.

As for market development, design technology and product development capability must be attained. The improvement of the production sector requires the upgrading of production technology, quality control technology, and machinery and equipment. To achieve these goals, partnership with foreign companies is undoubtedly the most effective approach, given the lack of marketing power, funds, and technology required, and the small domestic market. Working with competent foreign manufacturers will provide opportunities to upgrade technology (together with machinery and equipment) and learn design techniques. Also, the learning of management know-how including marketing will be important. It should be noted that ongoing joint ventures with foreign partners do not always provide the environment for local enterprises to absorb management and production technologies.

On the other hand, foreign direct investment cannot serve as a major engine for the development of the metalworking industry.

Generally, metalworking companies in industrialized countries go abroad for two reasons. First of all, they may be attracted by low labor cost. This is usually the case

when a host country is in an early stage of industrial development, and products are mostly exported. This applies to most projects seen in Viet Nam. On the other hand, metalworking manufacturers are tempted to make foreign investment when their customers go overseas. In fact, this is more important and effective in helping develop an inter-industrial linkage which is lacking in the host country. In other words, in Viet Nam where production of electronic and electrical products as well as automobiles has still to reach critical mass to form a sizable market for metalworking products, it is difficult to attract foreign metalworking companies.

It is important to remember, however, that Viet Nam has a traditional metalworking industry which can produce products with certain levels of quality, despite the old technology and equipment they use. Unfortunately, most of metalworking manufacturers are operated within large enterprises. If they are modernized and invigorated, they will develop into local suppliers which will then help increase local content for assembly manufacturers. Clearly, much effort is required to upgrade technology levels, modernize facilities and equipment, and promote quality control, without help from foreign companies. Once local metalworking manufacturers can produce products with higher quality, there is an export opportunity for them, considering that the industries in neighboring countries have not reached a competitive level, while production in Japan and other industrialized countries is becoming difficult due to the shortage of labor.

Table 1-1 Change in Major Economic Target to the Year 2000 at the National Changes of CPV

	June, 1991	July, 1994	June, 1996 (*)	Actual in 1995
GDP (1990=1)	2	2~2.5	2.5	
Economic growth rate (%/year)	8~8.5	8 (**)	9~10	
Agriculture and fisheries	4~4.5	-	4.5~5	4.7
Manufacturing	10~15	13~15	14~15	14.2
Service	-	-	12~13	10.2
Export	15~16	-	28	28.2
Ratio of Investment to GDP (%/year)	27.3~34.5	-	30	27.1
% of GDP				
Agriculture and fisheries	42.0	-	19~20	27.5
Manufacturing and construction	28.0	30	34~35	30.1
Service	-	-	45~46	42.4
Annual population increase rate (%)			less than 1.8	2.0

Notes: (*) Orientations and Tasks of the 1996 - 2000 Five-Year Plan for Socio-Economic Development
For the figures often than the above were cited and compiled from the materials provided for the National Congresses.
(**) November, 1994

Table 1-2 Major Economic Indices in Viet Nam and Selected Asian Countries (1994 - 1996)

	Year	Mid-year population ('000 people)	GDP					Expenditure of the Central Government	Consumer price increase (%)	Unemployment (%)	External trade			
			at current price	Real Term Annual growth (%)	per Capita (current US dollars)	% of GDP					Exports	Imports	Trade balance	Current balance
						Agriculture and fisheries	Manufacturing							
Viet Nam	1994	72,510	15,400	8.8	212	35.4	21.9	...	14.4	...	4,054	5,826	1,772	...
	1995	73,959	20,300	9.5	274	33.9	22.8	...	12.7	...	5,200	7,500	-2,300	...
	1996	...	...	9.3	...	...	...	...	4.5	...	7,000	11,000	-4,000	...
S. Korea	1994	44,453	380,700	8.6	8,508	7.0	27.2	53,263	6.2	2.4	93,676	96,821	-3,145	-4,530
	1995	44,851	456,500	9.0	10,037	6.6	27.2	67,267	4.5	2.0	123,241	127,990	-4,749	-8,816
	1996	45,248	484,600	7.0	10,548			72,051	5.0	2.0	129,700	150,300	20,600	23,000
China	1994	1,198,500	540,944	12.6	451	18.8	41.9	20,356	24.1	2.8	121,038	115,693	5,300	7,657
	1995	1,211,210	697,614	10.5	575	19.7	49.0	24,414	17.1	2.9	148,770	132,078	16,692	1,618
	1996	1,223,890	815,412	9.7	666	20.0	48.9	25,811	8.3	3.0	151,070	138,830	12,240	...
Thailand	1994	59,100	143,037	8.8	2,420	11.3	31.2	23,157	5.1	2.6	44,649	53,379	-8,730	-7,801
	1995	59,800	167,344	8.6	2,798	10.8	32.1	25,825	5.8	2.6	56,036	70,881	-14,845	-13,127
	1996	60,200	...	...	...	...	...	...	5.8	...	...	...	...	...
Malaysia	1994	19,500	72,512	9.2	3,370	14.6	31.7	17,162	3.7	2.9	56,589	54,850	1,739	-4,601
	1995	20,689	87,328	9.5	4,221	13.5	33.1	19,937	3.4	2.8	71,670	71,577	93	-7,463
	1996	21,169	98,110	8.2	4,635	12.7	34.5	21,887	3.6	2.6	72,338	72,493	1,845	-5,871
Indonesia	1994	192,222	168,644	7.5	877	17.4	23.5	32,172	9.2	...	40,223	32,322	7,901	-2,960
	1995	195,283	190,358	8.2	977	19.2	24.3	35,197	8.6	...	47,454	40,921	6,533	-6,760
	1996	...	...	...	...	...	...	...	6.2	...	49,774	44,489	5,285	-8,226

Notes: 1) Figures for Agriculture and fisheries in China is that of primary inducting. Manufacturing in China includes mining.

2) Expenditures of the Central government are in fiscal year except for S. Korea and China

Source: IDE, "Annual Report of Movement in Asian Countries (1997)." The original data were sourced from the materials in each country

International Financial Statistics, and others.

Figures for 1996 are provisional.

Table 1-3 Gross Domestic Product by Kind of Economic Activities (at constant price of 1989)

Bill. dongs

	1991	1992	1993	1994	1995
Total	31,286	33,991	36,735	39,982	43,797
Sector I: Agriculture, forestry and fishery	12,264	13,132	13,634	14,169	14,841
Sector II: Industry and construction	7,228	8,242	9,324	10,631	12,114
Industry	6,042	6,925	7,766	8,771	9,976
Construction	1,186	1,317	1,558	1,860	2,138
Sector III: Service	11,794	12,617	13,777	15,182	16,842
Transport, postal service and tele-communication	792	842	897	960	1,066
Trade, material supply	3,654	3,877	4,109	4,478	4,981
Finance, banking and insurance	448	496	578	710	874
State management, science, education, health, sport	2,841	3,040	3,322	3,760	4,086
Housing, tourism, hotel, repairs of personal consumer goods	4,059	4,362	4,871	5,274	5,835

Source: General Statistical Office, "Statistical Yearbook, 1995".

Table 1-4 Gross Domestic Product by Kind of Economic Activities (at current prices)

Bill. dongs

	1991	1992	1993	1994	1995
Total	76,707	110,535	136,571	170,258	222,840
Sector I: Agriculture, forestry and fishery	31,058	37,513	40,796	48,865	61,387
Sector II: Industry and construction	18,252	30,135	39,472	50,481	67,075
Industry	15,193	23,956	29,371	37,535	51,183
Construction	3,059	6,179	10,101	12,946	15,892
Sector III: Service	27,397	42,887	56,303	70,912	94,378
Transport, postal service and tele-communication	2,860	4,662	6,036	6,924	8,747
Trade, material supply	9,742	15,281	17,549	23,072	30,284
Finance, banking and insurance	1,108	1,567	2,318	3,450	5,580
State management, science, education, health, sport	6,807	9,718	14,402	18,270	22,600
Housing, tourism, hotel, repairs of personal consumer goods	6,880	11,659	15,998	19,196	27,167

Source: General Statistical Office, "Statistical Yearbook, 1995".

Table 1-5 Gross Domestic Product by Kind of Economic Activities
(% of total at current prices)

% of total

	1991	1992	1993	1994	1995
Total	100.0	100.0	100.0	100.0	100.0
Sector I: Agriculture, forestry and fishery	40.5	33.9	29.9	28.7	27.5
Sector II: Industry and construction	23.8	27.3	28.9	29.6	30.1
Industry	19.8	21.7	21.5	22.0	23.0
Construction	4.0	5.6	7.4	7.6	7.1
Sector III: Service	35.7	38.8	41.2	41.7	42.4
Transport, postal service and tele-communication	3.7	4.2	4.4	4.1	3.9
Trade, material supply	12.7	13.8	12.8	13.6	13.6
Finance, banking and insurance	1.4	1.4	1.7	2.0	2.5
State management, science, education, health, sport	8.9	8.8	10.5	10.7	10.2
Housing, tourism, hotel, repairs of personal consumer goods	9.0	10.6	11.7	11.3	12.2

Source: General Statistical Office, "Statistical Yearbook, 1995".

Table 1-6 Gross Domestic Product by Kind of Economic Activities (Annual growth rate at constant price of 1989)

%

	1991	1992	1993	1994	1995
Total	106.0	108.6	108.1	108.8	109.5
Sector I: Agriculture, forestry and fishery	102.2	107.1	103.8	103.9	104.7
Sector II: Industry and construction	109.0	114.0	113.1	114.0	113.9
Industry	109.9	114.6	112.1	112.9	113.7
Construction	105.2	111.0	118.3	119.4	114.9
Sector III: Service	108.3	107.0	109.2	110.2	110.9
Transport, postal service and tele-communication	106.5	106.3	106.5	107.0	111.0
Trade, material supply	104.8	106.1	106.0	109.0	111.2
Finance, banking and insurance	118.2	110.7	116.5	122.8	123.1
State management, science, education, health, sport	106.2	107.0	109.3	113.2	108.7
Housing, tourism, hotel, repairs of personal consumer goods	112.4	107.5	111.7	108.3	110.6

Source: General Statistical Office, "Statistical Yearbook, 1995".

Table 1-7 Change in Balance of Payments

(Unit: US$ mill.)

	1993	1994	1995	1996 *)
Exports	2,985	4,054	5,198	6,780
Imports	3,532	5,245	7,543	10,194
Trade balance	-547	-1,192	-2,346	-3,414
Service	-482	-318	-151	-374
Transfers	264	305	627	1,082
Current balance	-763	-1,205	-1,870	-2,706
Capital balance	352	897	1,807	2,991
(of which: direct investment)	832	1,048	1,781	2,300
Errors and omissions	-645	-101	-114	5
Overall balacne	-1,056	-409	-177	290
Growth rate of export	20.6	35.8	28.2	30.4
Growth rate of import	39.3	48.5	43.8	35.1
Current balance / GDP (%)	-7.5	-8.6	-10.0	-11.9

Note: *) Provisional

Source: World Bank, "Vietnam Fiscal Decentralization and the Delivery of Rural Services", October 31, 1996.

Table 1-8 Major Imported Products

(Unit: US$ mill.)

	1993	1994	1995
Raw materials / intermedeates	1,013	1,146	1,363
Petroleum Products	614	696	856
Fertilizer	189	247	339
Capital goods	922	1,815	2,761
Others	1,597	2,284	3,419
Total	3,532	5,245	7,543

Source: World Bank, "Vietnam Fiscal Decentralization and the Delivery of Rural Services", October 31, 1996.

Table 1-9 Major Exported Products

(Unit: US$ mill.)

	1993	1994	1995
Raw materials	988	1,074	1,286
Crude oil	844	866	1,024
Coal	70	75	81
Agricultural product	873	1,361	2,094
Rice	363	425	549
Light industrial goods	953	1,421	1,640
Marine products	427	551	620
Textile / garments	336	550	800
Shoes / sandals	68	122	200
Others	171	198	177
Total	2,985	4,054	5,197

Source: World Bank, "Vietnam Fiscal Decentralization and the Delivery of Rural Services", October 31, 1996.
General Statistical Office, "Statistical Yearbook 1995".

Table 1-10 Change in Foreign Direct Investment in Viet Nam

(Unit: US$ mill.)

	Number approved	Amount approved (US$ mill.)	Change over the previous year (%)	Annual invested amount (US$ mill.)	Change over the previous year (%)
1988	37	372		288	
1989	68	583	56.7	311	8.0
1990	108	839	43.9	407	30.9
1991	151	1,322	57.6	664	63.1
1992	197	2,165	63.8	1,418	113.6
1993	268	2,861	32.1	1,429	0.8
1994	343	3,766	31.6	1,730	21.1
1995	370	6,531	73.4	2,987	72.7
Total	1,542	18,438	50.7 (*)	9,235	49.0 (*)

Note: (*) Average of 1990 - 95.

Source: World Bank, "Vietnam Fiscal Decentralization and the Delivery of Rural Services", October 31, 1996.
General Statistical Office, "Statistical Yearbook 1995".

Table 1-11 Approved Foreign Direct Investment in Viet Nam by Country of Origin

(Unit: US$ mill.)

	1995		Total to 1995	
	Number	Amount	Number	Amount
Taiwan	53	1,152	238	3,134
Hong Kong	22	104	234	1,858
Japan	47	1,130	123	1,809
Singapore	37	488	119	1,559
South Korea	46	558	146	1,435
Vergin Is, UK	29	745	40	1,103
Australia	11	231	62	1,026
France	14	124	83	878
U.S.A.	22	531	50	756
Malaysia	12	94	49	685
U.K.	3	117	21	518
Swiss	3	50	18	513
Thailand	15	190	76	509
Others	56	1,017	283	2,655
Total	370	6,531	1,542	18,438

Source: General Statistical Office, "Statistical Yearbook 1995".

Table 1-12 Foreign Direct Investment by Industry (Total from 1998 through the end of December, 1995)

	Number	Amount approved (US$ mill.)	(%) of total
Agriculture and forestries	185	958	5.2
Fisher	69	300	1.6
Oil and gas	28	1,404	7.6
Heavy industries	270	3,019	16.4
Light industries	391	2,662	14.4
Construction	132	1,938	10.5
Hotel and tourism	169	3,294	17.9
Service	143	3,277	17.8
Transport and communication	93	1,256	6.8
Bank and finance	22	168	0.9
Cultural, medical and educational	40	162	0.9
Total	1,542	18,438	100.0

Note: Service includes businesses related to office building and apartments.
Light industries include food processing industry.

Source: General Statistical Office, "Statistical Yearbook 1995".

Table 1-13 National Finance

(Unit: Bill dongs)

	1990	1991	1992	1993
Revenue	63.72	106.09	210.23	321.99
Expenditure	91.86	120.81	237.11	390.63
Balance	-28.14	-14.72	-26.88	-68.64
Ratio of balance to GDP		-1.90	-2.40	-5.00
(GDP (*))		767.07	1,105.35	1,365.71

Note: (*) at current prices.

Source: General Statistical Office, "Statistical Yearbook, 1995".

Table 1-14 Saving and Investment Balance (In ratioes to GDP)

(Unit: %)

	1990	1991	1992	1993	1994	1995
Gross domestic investment rate	11.7	15.1	17.0	24.9	25.5	27.1
Government sector	5.1	2.8	5.8	7.0	6.6	5.7
Non-government sector	6.6	12.3	11.2	17.9	18.9	21.4
Gross domestic saving rate	7.4	13.2	16.3	17.4	16.9	17.1
Government sector	0.0	1.3	4.1	2.5	5.0	5.2
Non-government sector	7.4	11.9	12.2	14.6	11.9	11.9
Net deficit of current balance (foreign savings)	4.3	1.9	0.7	7.5	8.6	10.0

Source: World Bank, "Vietnam Fiscal Decentralization and the Delivery of Rural Services", October 31, 1996.

Table 1-15 Production Target of Major Industrial Products

Item	Unit	Achieved in 1995	Plan		
			2000 (*1)	2010 (*1)	2000 (*2)
1 Electricity	mil. kWh	14,874	33,000	87,800	25,000 ~30,000
2 Washed coal	mil. tons	7.1	8.5 ~ 10	13 ~ 15	10.0
3 Steel and steel product	1,000 tons	365	3,000	8,000	2,000
4 Urea fertilizer	1,000 tons	110	910	2,000	
5 Phosphate fertilizer of all kinds	1,000 tons	794	1,180	2,700	
6 Diesel engine	unit	4,334	44,000	55,000	
7 Electric motor	-	28,000	46,000	55,000	
8 Transformer	-	4,000	7,700	15,000	
9 Machine - tools	-	293	600	1,500	
10 Industrial pump	1,000 units	960	1,730	4,000	
11 Automobile tyres and tubers	-	54.8	700	2,300	
12 Fabric	mil. meters	450	1,000	2,000	
13 Paper	1,000 tons	125	500	1,200	
14 Cigarette	mil. packets	1,456	2,000	2,460	
15 Beer	mil. liters	460	800	1,500	
16 Milk condensed	mil. cans	175	200	800	
17 Vegetable oil	1,000 tons	24	100	300	
18 Shoes	mil. pairs	21	220	380	
19 Detergent	1,000 tons	80	140	250	
20 Television	1,000 sets	376	950	2,000	
21 Apatite ore	1,000 tons	600	1,000	1,800	
22 Soda ash	-			150	
23 Caustic soda	-	7.5	45	150	
24 Polyvinyl chloride (PVC)	-		180	300	
25 Dioctyl phtalate (DOP)	-		60	120	
26 Methanol	-		660	1,300	
27 Synthetic fiber	-			100	
28 Polyethylene + polypropylene (DE + PP)	-			500	
29 Cement	1,000 tons	5,854			18,000 ~20,000

Note / Sources: (*1): Ministry of Industry, "A Guide to the Ministry of Industry".
(*2): Orientation and Tasks of the 1996 - 2000 Five-Year Plan for Socio-Economic Development

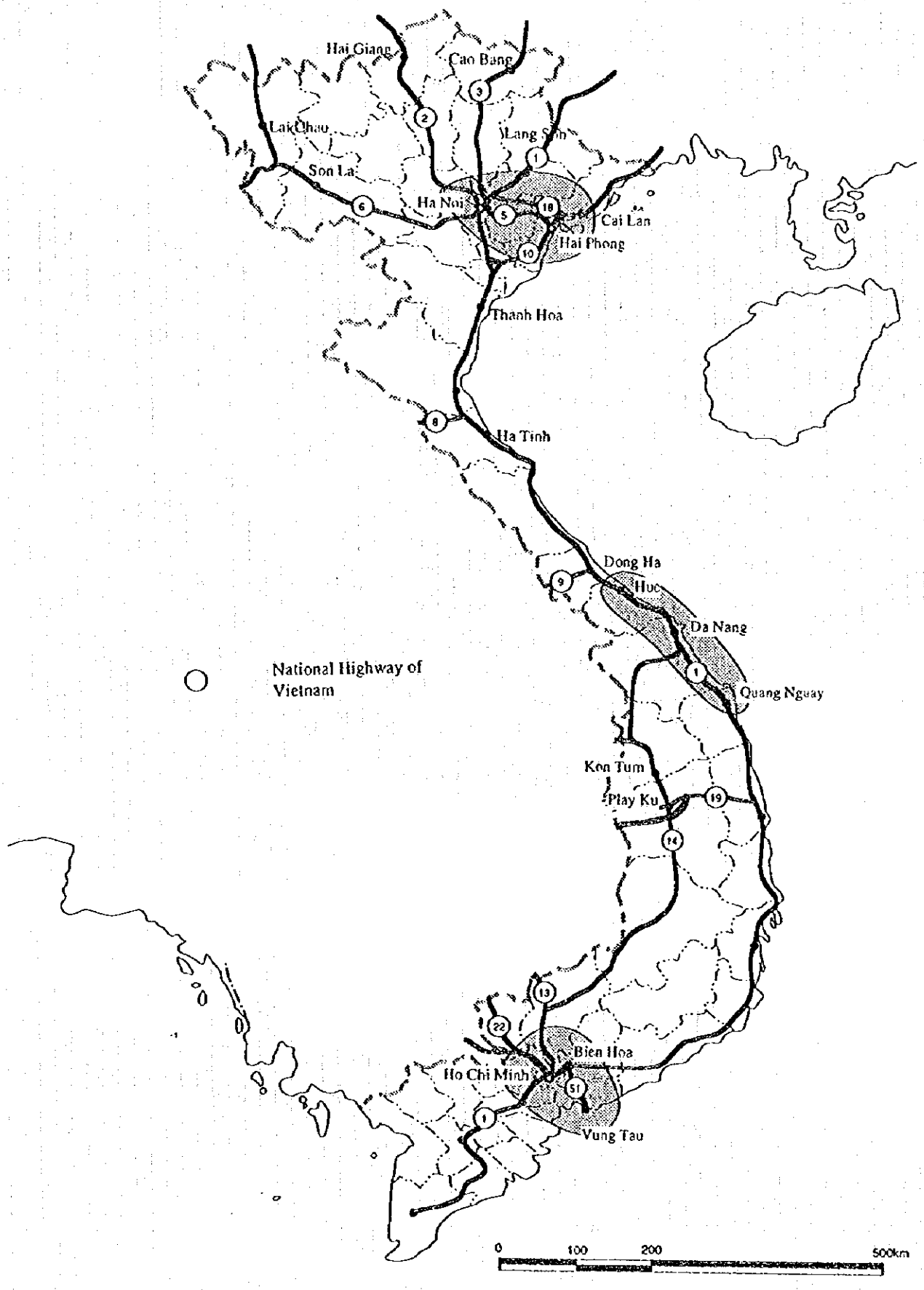
Table 1-16 List of Key Manufacturers by Subsector (1/2)

			Fabricated metal products	Structural metal products, tanks, boilers	Metal working & others	Metal working	Casting of metals	Forging	Pressing and stamping	Others	Treatment and coating of metals	Cutlery, hand tools, general hardware	Other fabricated metal products n.e.c.	Industrial machinery and equipment	General purpose machinery	Engines and turbines	Pumps, compressors taps and valves	Bearings, gears, driving elements	Ovens, furnaces and furnace burners	Lifting and handling equipment	Other general purpose machinery	Special purpose machinery	Agricultural and forestry machinery	Machine-tools	Machinery for metallurgy	Machinery for mining/construction	Machinery for food processing	Machinery for textile/apparel	Other special purpose machinery	Office, accounting, computing machinery	Electrical machinery and apparatus	Industrial electrical machinery/equipment	Electric motors, generators, transformers	Electricity distribution/control apparatus	Insulated wire and cable	Household electrical appliances	Household electrical appliances	Dry cells, batteries	Electric lamps and lighting equipment	Small wiring equipment/devices	Electronic equipment and components	Consumer electronic equipment	Industrial electronic equipment	Electronic components	Medical, precision, optical appliance	Automobile and automotive parts	Motor vehicles	Bodies for motor vehicles	Automotive parts	Other transport equipment
1 VietNam Steel Corp. (VSC)	MOI																																																
1 Thai Nguyen Iron and Steel Co. (TISCO)		Bac Thai		x			x						x																																				
2 Southern Steel Co.		HCMC		x			x						x																																				
1) Tan Thuan Steel Works		HCMC		x			x																																									
2) Bien Hoa Steel Works (VICASA)		Bien Hoa		x			x	x		x																																						
3) Mechanical Engineering & Metallurgy Factory (SADAKIM)		Bien Hoa		x			x			x								x						x																								
2 Vietnam Engine & Agricultural Machinery Corp (VEAM)	MOI																																															
1 Song Cong Diesel Engine Co.		Bac Thai					x	x	x	x						x			x																													
2 Tractor and Agricultural Machinery Co.		Ha Tay					x	x	x													x																									
3 Tran Hung Dao Mechanical Factory		Hanoi					x	x	x							x																															
4 Engine Manufacture Co. (VINAPPRO)		Dong Nai					x			x						x	x									x																					
5 South Agricultural Machine Co. (VIKYNO)		Dong Nai					x	x	x							x										x																					
6 Co Loa Mechanical Engineering Factory		Hanoi						x	x		x		x					x																														x
7 Spare Parts Co. No. 1		Bac Thai					x	x	x																																							
8 Pho Yen Mechanical Factory		Bac Thai						x			x							x												x																		x
9 Precision Equipment Factory No. 1		Hanoi						x	x								x																															x
10 Materials and Complete Equipment Co.		Hanoi																																														
11 Spare Parts Co. No. 2 (NAKYCO)		HCMC					x	x		x																																						
12 Foundry Company (FONACO)		HCMC					x			x																																							
3 Vietnam Machine & Industrial Equipment Corp. (MIE)	MOI																																															
1 Caric Co.		HCMC		x			x	x	x		x															x																						
2 Ha Noi Mechanical Co.		Hanoi		x			x	x	x	x													x			x									x											
3 Cutting Tools and Measuring Devices		Hanoi						x		x	x												x																								
4 Hai Duong Pump Factory		Hai Hung					x	x	x	x	x							x																													
5 Tu Son Regulations Factory		Ha Bac						x			x		x																																			
6 Regulations No. 2 Factory		HCMC											x																																			
7 Mechanical Engineering Factory		HCMC		x					x				x																																			
8 Thu Duc Agricultural-Mechanical Factory		HCMC								x								x					x					x		x																
9 Duyenha Mechanical Company		Hai Phong		x			x	x		x	x																																					
10 Export Mechanical Tools Co.		Hanoi						x	x	x	x																																					
4 Vietnam Electro-Technical Equipment Corp. (VEC)	MOI																																															
1 Vietnam Electric Cables and Wires (CADIVI)		HCMC																																														
2 Electrical Equipment Manufacturing Factory No.4 (THIBIDI)																																															
3 Electrical Equipment Technique Institute																																															
4 Electrical Equipment Materials Import Export Company																																															
5 Electricity Measuring Device Factory (EMIC)																																															
6 Viet Nam-Hungary Electric Motor Manufacturing		Hanoi																																													

Table 1-16 List of Key Manufacturers by Subsector (2/2)

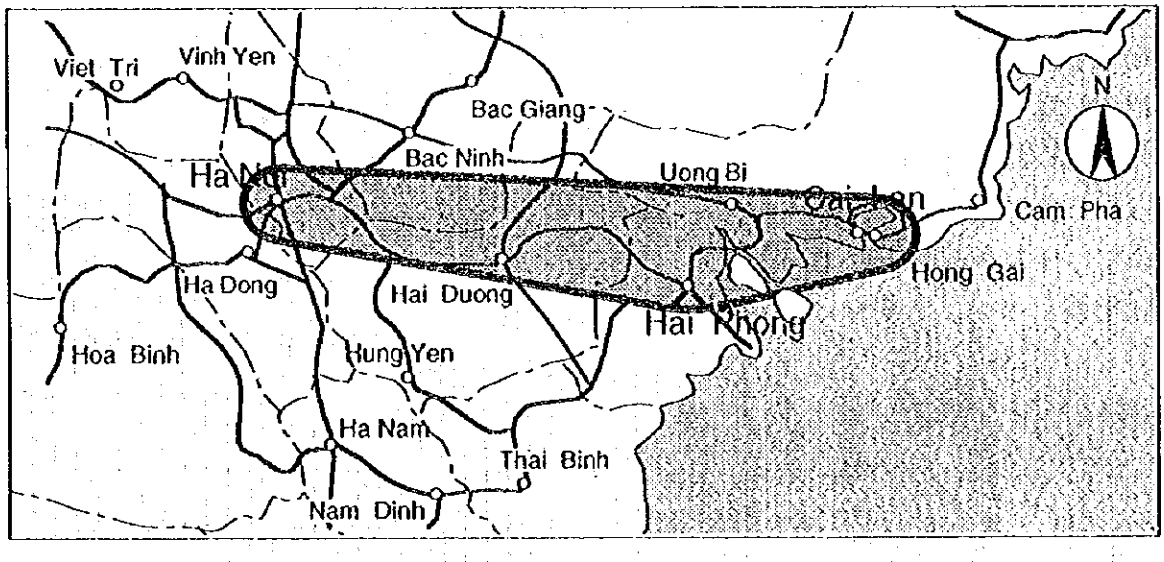
			Fabricated metal products	Structural metal products, tanks, boilers	Metal working & others	Metal working	Casting of metals	Forging	Pressing and stamping	Others	Treatment and coating of metals	Cutlery, hand tools, general hardware	Other fabricated metal products n.e.c.	Industrial machinery and equipment	General purpose machinery	Engines and turbines	Pumps, compressors taps and valves	Bearings, gears, driving elements	Ovens, furnaces and furnace burners	Lifting and handling equipment	Other general purpose machinery	Special purpose machinery	Agricultural and forestry machinery	Machine-tools	Machinery for metallurgy	Machinery for mining/construction	Machinery for food processing	Machinery for textile/apparel	Other special purpose machinery	Office, accounting, computing machinery	Electrical machinery and apparatus	Industrial electrical machinery/equipment	Electric motors, generators, transformers	Electricity distribution/control apparatus	Insulated wire and cable	Household electrical appliances	Household electrical appliances	Dry cells, batteries	Electric lamps and lighting equipment	Small wiring equipment/devices	Electronic equipment and components	Consumer electronic equipment	Industrial electronic equipment	Electronic components	Medical, precision, optical appliance	Automobile and automotive parts	Motor vehicles	Bodies for motor vehicles	Automotive parts	Other transport equipment
7 Electric Devices Works Company No. 1		Hanoi																														x	x																
8 Electro-mechanical Production Factory		Hanoi																														x	x																
9 Electric Transformer Manufacturing Factory		Hanoi																														x	x					x										
10 Electrical Insulation Material Factory		Hanoi																														x	x															
5 Power and Mining Mechanical Corp. (POMIMECO)	MOI																																															
1 Campha Central Mechanical Engineering Co. (CCMEC)		Quang Ninh					x	x	x	x	x		x				x		x						x	x		x					x															
2 Campha Motor Engineering Co.		Quang Ninh																																														x	
3 Campha Electric Equipment Manufacture Co.																																x																
4 Materials, Transport and Building Materials Production Co.																																																
6 Electricity of VietNam (EVN)	MOI																																															
1 Electric Equipment Production Co.																																		x														
2 Information and Telecommunication Co.																																															
7 Viet Nam National Chemical Corp. (VINACHEM)	MOI																																															
1 Dry Cell & Storage Battery Co. (PINACO)		HCMC																																				x										
2 Hanoi Dry Cell Co.																																						x										
3 Southern Dry Cell and Storage Battery Co.																																						x										
4 Vinh Phu Storage Battery and Dry Cell Co.																																						x										
5 Tia Sang Battery Co.																																						x										
8 VietNam Electronics and Informatics Corp. (VEIC)	MOI																																															
1 Vietronics Dongda Co.		Hanoi																																													x		
2 Viettronics Bien Hoa Co.		HCMC																																			x									x		
3 Viettronics Thu Duc Co.		HCMC																																				x									x		
4 Viettronics Tan Binh Co.		HCMC																																					x								x		
5 Viettronics Binh Hoa Co.		HCMC																																						x							x		
6 Viettronics Phu Tho Hoa Co.		HCMC											x																																		x		
7 Vietnam Computer Co. 2 (CMT)		HCMC																																													x	
8 Viettronics Thinh Hao Co. (VITHICO)		Hanoi																																													x	
9 Industrial Ceramic and Glass Corpration (VINACEGLASS)																																															
1 Rang Dong Light Sources and Vacuum Flask Co.		Hanoi																																														
2 Dien Quang																																															
10 Hanoi People's committee																																															
1 Giang Vo Electronic (GIVICO)	Prov.	Hanoi																																													
2 Hanoi Electronic (HANEL)	Prov.	Hanoi																																													
11 HCMC People's committee																																															
1 Saigon Electronics (SAGEL)	Prov.	HCMC																																													

Figure 1-1 Three Strategic Development Areas



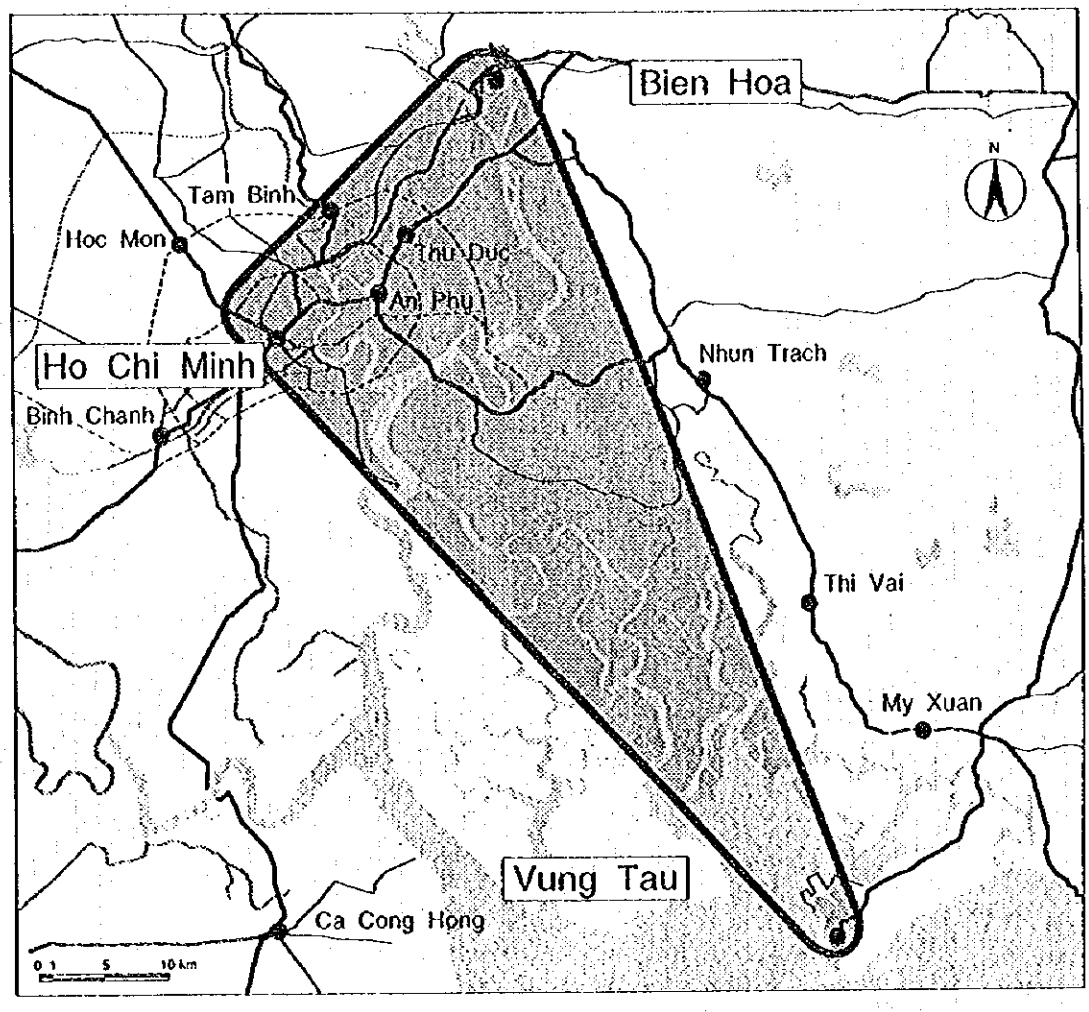
Source : ECFA(Engineering Consulting Firms Association, Japan), "Investment Promotion and Environmental Protection in Viet Nam ", (1995).

Figure 1-2 Triangle Development Area in the North



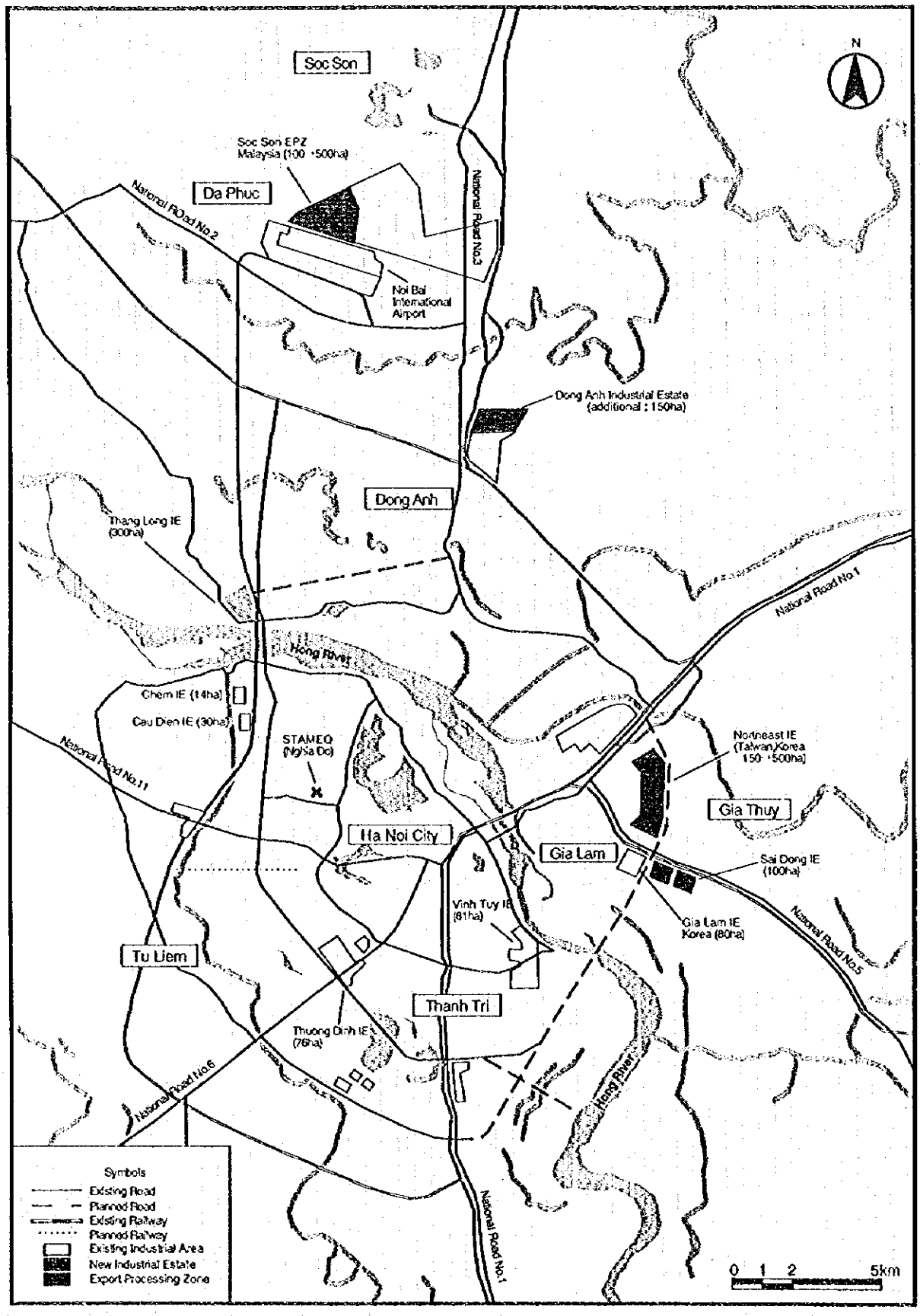
Source : ECFA(Engineering Consulting Firms Association, Japan), "Investment Promotion and Environmental Protection in Viet Nam ", (1995).

Figure 1-3 Triangle Development Area in the South



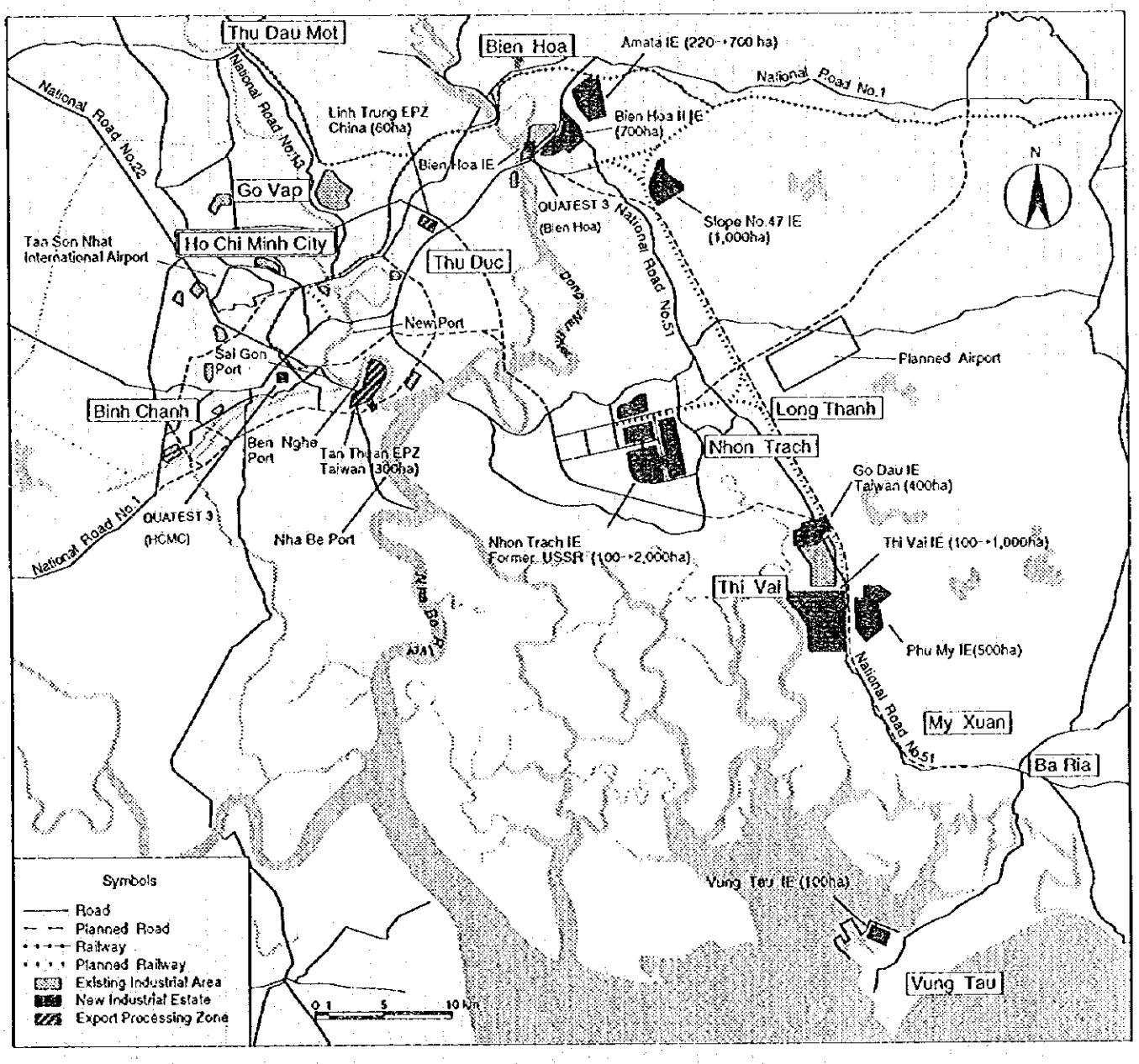
Source : ECFA(Engineering Consulting Firms Association, Japan), "Investment Promotion and Environmental Protection in Viet Nam ", (1995).

Figure 1-4 Location of Industrial Areas in Hanoi



ureo : ECFA(Engineering Consulting Firms Association, Japan), "Investment Promotion and Environmental Protection in Viet Nam", (1995).

Figure 1-5 Location of Industrial Areas in the South Triangle Development Area



Source : ECFA(Engineering Consulting Firms Association, Japan), "Investment Promotion and Environmental Protection in Viet Nam", (1995).