

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF INDUSTRIES, SCIENCE AND TECHNOLOGY
DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

STUDY ON INDUSTRIAL SECTOR DEVELOPMENT

FINAL REPORT

VOLUME I
SUMMARY

March 1993

NIPPON KOEI CO., LTD.

UNICO INTERNATIONAL CORP.

JAPAN EXTERNAL TRADE ORGANIZATION

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SRI LANKA STUDY ON INDUSTRIAL SECTOR DEVELOPMENT FINAL REPORT VOL. I SUMMARY March 1993



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Volume I	Summary
Volume II	Export and Investment Promotion
Volume III	Metalworking Industry
Volume IV	Development Plan of Industrial Estates

Preface

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct a study on Industrial Sector Development in the Democratic Socialist Republic of Sri Lanka and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Sri Lanka a study team headed by Mr. Hajime Koizumi, Nippon Koei Co., Ltd. four times between March 1992 and March 1993.

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

I hope that this report will contribute to the development of the industrial sector in Sri Lanka and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Democratic Socialist Republic of Sri Lanka for their close cooperation extended to the team.

March 1993

Kensuke Yanagiya
President
Japan International Cooperation Agency

Kensuke Yanagiya

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ABBREVIATIONS

BOI	:	Board of Investment (formerly GCEC)
CEA	:	Central Environmental Authority
CISIR	:	Ceylon Institute of Scientific and Industrial Research
DFCC	:	Development Finance Corporation of Ceylon
EDB	:	Export Development Board
EIRR	:	Economic Internal Rate of Return
EPZ	:	Export Processing Zone
FDSI	:	Foundry Development Service Institute
FIRR	:	Financial Internal Rate of Return
GCEC	:	Greater Colombo Economic Commission
IDB	:	Industrial Development Board
JETRO	:	Japan External Trade Organisation
JICA	:	Japan International Cooperation Agency
MIST	:	Ministry of Industries, Science and Technology
NIBM	:	National Institute of Business Management
NIEs	:	Newly Industrialized Economies
SAARC	:	South Asian Association for Regional Cooperation
SLSI	:	Sri Lanka Standards Institution
UNIDO	:	United Nations Industrial Development Organisation

1. INTRODUCTION

1.1 Background of Study

The Government of the Democratic Socialist Republic of Sri Lanka (the Government) has been striving for improvement of the chronic deficit in trade balance and acceleration of economic development in the country. In the industrial sector, the Government through the Ministry of Industries, Science and Technology (MIST) worked out "A Strategy for Industrialisation in Sri Lanka" in 1989, which aimed at the promotion of export-oriented industries and the strengthening of industrial structure under the framework of the market-oriented economy.

To assist in the formulation of definite programmes for the industrial sector development under the framework and strategies deployed by MIST, the Government of Sri Lanka requested the Government of Japan to execute studies on "The Industrial Sector Development through Consolidation of Metalworking Industry" and "The Development of Industrial Estates", in June 1991. The Government of Japan, through the Japan International Cooperation Agency (JICA), sent a preliminary study team to Sri Lanka for discussions with MIST and other agencies concerned. It was agreed by MIST and the JICA team that the study on the development of industrial estates would be incorporated into the study on the industrial sector development, and the terms of reference for "The Study on Industrial Sector Development" were concluded on November 14, 1991. This Study has been executed by the JICA Study Team in accordance with the terms of reference agreed to between MIST and JICA.

1.2 Objectives and Scope of Study

The objectives of this study are to formulate definite programmes for accelerated development in the industrial sector, as well as for promotion of export and investment. The study is mainly composed of the following sub-sector studies:

- (1) Study on export and investment promotion,
- (2) Study on consolidation of metalworking industry, and
- (3) Study on industrial estate development.

The terms of reference specify that the study will incorporate the following major work items:

(1) Export and Investment Promotion

- Market analysis of major articles for export, and formulation of programmes for export promotion
- Formulation of recommendable programmes for strengthening export promotion systems and functions
- Formulation of recommendable programmes for investment promotion

(2) Consolidation of Metalworking Industry

- Analysis of present status and constrains in metalworking industry
- Formulation of recommendable programmes to consolidate metalworking industry
- Formulation of recommendable programmes to improve foundry industry

(3) Industrial Estates Development

- Investment demand survey and selection of industries to be located
- Selection of industrial estate sites
- Formulation of development plans and evaluation

Through discussions at the commencement of the study, it was agreed that the major articles for export promotion study should be (i) garment/apparel, (ii) gems and jewellery, and (iii) rubber-based products. It was also agreed that the study on metalworking industry should focus on the foundry industry, in principle.

1.3 Execution of Study

This study has been executed by the consortium of consultants entrusted by JICA. The consortium is composed of the following organisation and consulting firms:

Study on Export and Investment Promotion -----	Japan External Trade Organisation (JETRO)
Study on Metalworking Industry -----	UNICO International Corp.
Study on Industrial Estates -----	Nippon Koei Co., Ltd.

The Study was initiated in March 1992 and completed in March 1993. In the course of the study, field survey and discussions with Sri Lanka counterpart experts were executed in March, June - July, and November 1992, and in March 1993.

The participants in this study, from the consortium of consultants, MIST counterparts, and the Steering Committee formed to supervise the study in Sri Lanka, are shown in Table-1.

1.4 Reports

The Final Report of the study consists of four (4) volumes. Volume-I summarises the results of the study on export and investment promotion, consolidation of metalworking industry, and industrial estates development, as well as the recommendations for action programmes in each sub-sector. In Volume-II, details of the study on export and investment promotion are presented. In Volume-III, the results of the study and recommendations on consolidation of the metalworking industry are described in detail. Volume-IV presents the plans formulated and evaluated for the development of industrial estates.

2. BACKGROUND OF INDUSTRIAL SECTOR

2.1 Industrial Production

According to the latest publications by the Central Bank of Sri Lanka, the Gross Domestic Product (GDP) was Rs. 135.4 billion in 1991, of which the manufacturing sector contributed Rs. 24 billion or 17.7% of total GDP. If compared with 14.4% in 1982 and 16.2% in 1987, the sectoral contribution has been steadily increasing. The sectoral GDP increased at an average annual rate of 6.6% in 1982 - 87 and 6.3% in 1987 -91. However, if compared with the average industrial sector's contribution to the national economy for ASEAN countries (25.4% in Thailand, 25.0% in the Philippines, and 26.6% in Malaysia), the contribution of the manufacturing sector is still low in Sri Lanka.

Gross output of industrial production reached Rs. 100.2 billion in 1991, of which about 61% was produced in the food and beverage sub-sector (26.9%) and the textile, apparel, and leather sub-sector (34.5%). The production of the metalworking and machinery sub-sector accounted for only 5.1% of the sectoral gross output. The total value added in the manufacturing sector amounted to about Rs. 29 billion in 1990. Value added in the food and beverage industries accounted for 51% and the textile, apparel, and leather industries for 23%. On the other hand, value added in the metalworking industries accounted for 5.2% of the total sectoral value added.

Employment in the manufacturing sector reached approximately 244,000, or about 14.1% of total employment in 1990. The employment in the food and beverage sub-sector and textile and apparel sub-sector represented about 68% of the total sectoral employment.

2.2 Industrial Structure

Historically, Sri Lanka relied on a plantation economy in the colonial times, a mixed economy for protection of domestic industry and promotion of import substitution industry applied after World War II, and a market-oriented economy for export promotion after 1977. With such a historical background, the industrial structure in Sri Lanka has not been well developed, and it depends largely on local material type industries (such as food and beverage) and the textile and apparel industries. Basic material type industries (such as non-metallic products and basic metal products) have not been developed, due mainly to the relatively small domestic market. High processing type industries (such as fabricated metal products and machinery) have also been lagging. This trend has remained unchanged in the last five years, as illustrated in Figure-1.

With this industrial structure in view, it becomes obvious that the development of high processing type industries and the consolidation of metalworking industry (to support high processing type and other types of industry) are fundamental for industrial sector development in Sri Lanka in the medium and long-term. Further, it is noted that Sri Lankan industries are generally self-reliant, and production sharing or subcontracting systems have not been well developed. It is therefore obvious that one of the strategies to consolidate the industrial structure is to promote the production sharing systems and to strengthen linkages among the industries involved in such systems.

2.3 Exports of Industrial Products

Sri Lanka's exports have doubled in value over the last four years, and they reached Rs. 84.4 billion (about \$2 billion) in 1991. This growth has been attained through an increase in exports of non-traditional commodities (mainly industrial products, gemstones, and other minerals). The export value of industrial products has more than doubled over the last three years, accounting for about 60% of total exports in 1991.

The largest export items are garments and apparel. The export value of this category has surpassed that of traditional commodities, and it accounted for 37% of total exports in 1991. Other major export items are gems and jewellery (with a share of 6.3%), petroleum products (3.9%), machinery and electrical appliances (3.1%), food and beverage (1.7%), rubber-based products (1.5%), and ceramic products (1.4%).

Under the National Export Development Plan 1990 - 94, priority has been given to the development and promotion of non-traditional commodity industries, and the export-oriented manufacturing sector in particular. In achieving the export targets set out under this Plan, exports of highly contributing products should be promoted, such as garments and apparel (contribution ratio of 24.5%), gems and jewellery (25.0%), rubber-based products (4.6%), chemicals and plastics (2.8%), and coconut-based products (1.9%) (Refer to Figure-2).

Export value of the metalworking industries was about Rs. 820 million in 1991, of which 76% was produced in the Export Processing Zones (tools, bolts and nuts, ornamental chains, bicycle parts, etc.). Production in areas outside EPZs are limited to simple products, such as cans, agricultural tools and sprayers.

2.4 Industrial Development Policy

MIST, which is responsible for formulating policies for industrial development, worked out "A Strategy for Industrialisation in Sri Lanka" in 1989, with the objectives to promote export-oriented industries, to encourage foreign investment, and to consolidate industrial structure. The strategy for industrialisation includes:

- To adopt prudent macro-economic policies to stabilize the national economy;
- To grant special incentives for investments and exports;
- To promote greater savings, both domestic and foreign;
- To encourage foreign investments with a view to increase capital inflows, acquire technology, and achieve market access;
- To promote privatisation of public enterprises;
- To promote export-oriented industries;
- To establish a linkage between large industries and small producers with a view to consolidate the industrial structure;
- To promote more research and training of human resources; and
- To remove administrative barriers by eliminating the need for entrepreneurs to seek administrative clearance such as import licenses and permits.

Based on the above strategies, the following two measures are envisaged for accelerated industrial development:

- To promote export-oriented industries by attracting foreign investment
- To attain higher productivity by promoting privatisation of public enterprises

2.5 Framework for Industrial Sector Development

Through a brief review of the recent trend in industrial production, industrial structure, exports of industrial products, and strategies for industrialisation adopted by MIST as noted above, the principal framework for the promotion of export and investment, consolidation of the metalworking industry, and development of industrial estates is envisaged. The framework is summarised as follows:

(1) Promotion of exports and export-oriented industries

In addition to the restoration of political and social stability, the positive effects of export promotion policies have greatly contributed to the recent expansion of exports in Sri Lanka. In aiming at continuous and stable expansion of exports in the future, Sri Lanka should promote export-oriented industries, and strengthen export and investment promotion policies, systems, and organisations. In this context, the export and investment promotion study should elaborate definite programmes for export promotion in the short, medium, and long term, after analyzing the markets for export of garments and apparel, gems and jewellery, and rubber-based products.

In the study on consolidation of the metalworking industry, the technological improvement is a matter calling for prior resolution. However, the possibility to export machinery, spare parts, and foundry products should be studied when technology has improved in the future.

In the study on industrial estates development, the framework should be set out to locate as many export-oriented industries as possible in the proposed industrial estates and to directly contribute to the promotion of exports.

(2) Promotion of industrialisation to consolidate industrial structure

As pointed out in Section 2.2 above, the industrial structure in Sri Lanka has not been well developed, and basic material type industry such as the metalworking industry and high processing type industry, has lagged behind. In this context, consolidation of the metalworking industry is a strategy of fundamental importance because it will support high processing type and other types of industries. This study should work out definite programmes to consolidate the metalworking industry in the short, medium, and long term. Further, this study should pin-point the constraints in the foundry industry and propose measures for their improvement.

At the same time, the study on consolidation of the metalworking industry should focus on subcontracting systems for production sharing in order to find out the possibility of applying them to strengthen linkage among industries and to consolidate industrial structure in Sri Lanka.

In the study on the industrial estates development, attention should be drawn to the possibility of locating machinery and fabricated metal industries in

the estates, which would also contribute directly and indirectly to the consolidation of industrial structure.

(3) Promotion of industrialisation through privatisation

Since 1989, the Government has been promoting policies for privatisation of public enterprises. In the metalworking industry, public enterprises have been privatized rapidly and they are scheduled to be totally privatized, except for a few enterprises. Consequently, the programmes for consolidation of the metalworking industry should be worked out in the framework of promotion of privatisation.

In the study on industrial estates development, institutional study should be made to evaluate the possibility of inviting the private sector to manage and implement the estates development.

(4) Relationship among sub-sectoral studies

The study on export and investment promotion, consolidation of the metalworking industry, and development of industrial estates will be conducted separately in order to elaborate respective programmes for development in each sub-sector. However, attention should be paid to deliberate some relationship among the three sub-sectors to be studied. For instance, a study will be carried out if it is appropriate to locate industries of major articles for export studied in the export and investment promotion sub-sector, in the industrial estates proposed in the other sub-sector. Likewise, a study will be carried out if it is possible to improve infrastructures for export and investment promotion by means of industrial estate development. Further, in the event that factories for the metalworking industry are proposed to be collectively located and that a plan for industrial park for metalworking industry is to be studied, the possibility of locating such an industrial park in the proposed industrial estates will be examined. It is noted additionally that the study on investment promotion will recommend some promotional activities to invest in the proposed industrial estates.

3. EXPORT AND INVESTMENT PROMOTION

3.1 Basic Concept for Export Promotion

As briefly reviewed in Section 2.3, the export value of industrial products has more than doubled over the last three years, and the National Export Development Plan 1990 - 94 envisages further promotion of exports, particularly in the non-traditional and export-oriented manufacturing sector. In achieving the export targets set out under the National Export Development Plan, it will be necessary to promote three categories of industry - garments and apparel, gems and jewellery, and rubber-based products - which will make a larger contribution to the increase in total exports. Therefore, the current study has mainly focused on these three categories of industry. Further, some statistical analysis have also been made on the next three largest products for export, i.e. ceramic products, processed foods, and coconut-based products, on the basis of import statistics in OECD countries and Japan.

In aiming at continuous and stable expansion of exports in the future, Sri Lanka should strengthen export-oriented industries, as well as export and investment promotion policies, systems and organisations. For sustainable export expansion, it will be required to strengthen both price competitive factors (cost reduction and improvement in productivity) and non-price competitive factors (quality improvement and strengthening of marketing). To this end, private enterprises should improve and modernize production technology, quality control, management skills, and marketing. On the other hand, various public services will be required to support private initiative in order to sustain expansion of exports. This concept for export promotion is illustrated in Figure-3.

Implementing organisations of the action programmes to be proposed in this Study will play an important role for the improvement and strengthening of export-oriented industries, and export and investment promotion policies. Major relevant organisations are listed in Table-2. Among these organisations, MIST, EDB and BOI are expected to play key roles in areas of policy matters, export promotion and investment promotion, respectively. Industrialisation Commission has a function to take initiatives in coordination among relevant organisations.

3.2 Promotion of Export-Oriented Industries

Sri Lanka's programme for economic development focuses on a policy of export-oriented industrialisation, based on the market mechanism. In line with this policy and for the development and promotion of export-oriented industries, the basic perspectives for the

study are as follows: 1) consideration of market requirements and competition in export markets, 2) manufacture of higher quality, more competitively priced products, and 3) achievement of continued stable export expansion in the future.

Based on these perspectives, the major problems and issues faced by the three industrial sectors are summarised in the table below. Many of these are shared by other industrial sectors as well.

Major Issues for Promotion of the Three Industrial Sectors

Sectors	Production Capabilities	Export Capabilities	Public Support Services
Garments and Apparel	<ol style="list-style-type: none"> 1) Stable supply of fabrics and auxiliary materials 2) Human resource development 3) Extensive production management 4) Introduction of new technologies and development of designs 	<ol style="list-style-type: none"> 1) Improvement of export marketing capability 2) Expansion of export quotas and development of new markets 3) Promotion of export activities 	<ol style="list-style-type: none"> 1) Expansion of policy support 2) Coordination and strengthening of government agencies 3) Improvement of business environment
Gems and Jewellery	<ol style="list-style-type: none"> 1) Stable supply of raw materials 2) Human resource development 3) Adequate machinery 4) Improvement of technology (including heat treatment) 	<ol style="list-style-type: none"> 1) Improvement of export marketing capability 2) Finding overseas buyers 3) Strengthening of sales promotion activities 	<ol style="list-style-type: none"> 1) Improvement of policy support 2) Strengthening of government agencies 3) Improvement of business environment
Rubber-based Products	<ol style="list-style-type: none"> 1) Improving the quality of raw materials and sub-materials 2) Guidance in plant management 3) Promotion of quality control 	<ol style="list-style-type: none"> 1) Implementation of export marketing 2) Training of personnel capable of export marketing 	<ol style="list-style-type: none"> 1) Strengthening of R&D and testing and inspection organisations 2) Setting standards, promoting standardization, establishment of export inspection system 3) Improvement of infrastructure 4) Conservation of the environment and safety and hygiene policies

Promotion programmes are recommended by sector, taking respective promotion policies and applicable resources (domestic and foreign ones including foreign economic cooperation schemes) into account and then formulating programmes by combining promotion policies. Programmes are divided into short term (one to three years) and medium to long term (four or more years) ones. Action programmes for the promotion of

the three industrial sectors (garments and apparel, gems and jewellery, and rubber-based products) are summarised in Table-3 to Table-5.

3.3 Export Promotion Policies, Systems and Organisations

Sri Lanka has done an excellent job of establishing export promotion policies, systems, and organisations. They are on a par with or ahead of those of other countries, and most users find them useful. However, there have been many requests for their improvement and their implementation in particular, such as simplifying and speeding up procedures. Furthermore, users would like more support from the Government and EDB in areas such as human resource development, technical and managerial guidance at factories, and the development of foreign markets.

Key issues for the improvement of export promotion policies, systems, and organisations are as follows: 1) establishment of a reliable infrastructure and public support system, 2) implementation of strategic export promotion programmes, 3) emphasis on technical and managerial guidance on the plant floor, and 4) strengthening of EDB as a central public export promotion organisation.

Based on these key issues, the following recommendations for the improvement of export promotion policies, systems, and organisations are offered for the short and medium to long-term. The short-term recommendations will include: 1) implementation of export promotion activities, mainly by EDB, and 2) enhancement of EDB facilities (an overseas information system, exhibition services for the World Trade Centre, etc.). Recommendations for the medium and long term will include: 1) promotion of standardisation and strengthening of TQM, 2) fostering of manpower for export marketing, 3) fostering of managers and improvement of productivity, 4) augmentation of financial systems for expansion and modernisation of facilities, and 5) fostering of supporting industries. Action programmes for export promotion are summarised in Table-6.

3.4 Investment Promotion Policies, Systems and Organisations

Sri Lanka's current investment promotion policies and systems are well-established in general. They are considered as good as or better than those of other countries, and the "One-stop service" of BOI is also considered useful by many investors. However, Sri Lanka's investment climate is not necessarily the best in Asia. In addition, it was determined through the study that there is still a lack of overseas promotion activities by BOI.

Major issues for the improvement of investment promotion policies, systems, and organisations are as follows:

- (1) Improvement of investment incentives and policies (streamlining and acceleration of procedures, rationalization and modernization of related laws and regulations, including labor legislation)
- (2) Establishment of a better investment climate (open economic policies, maintain political and social stability, improvement of infrastructures and support systems, etc.)
- (3) Enhancement of foreign investment promotion activities, including publicity overseas.

Based on these key issues, the following programmes are recommended for the improvement of investment promotion policies, systems, and organisations:

Short-term programmes by BOI:

- (1) Strengthening of foreign investment promotion activities
- (2) Invitation of foreign advisors for investment promotion
- (3) Improvement of information materials on foreign investment
- (4) Promotion of dialogues with foreign companies in Sri Lanka
- (5) Improvement of investment incentives and policies

Medium and long-term programmes:

- (1) Improvement of infrastructure
- (2) Expansion of BOI
- (3) Study on the SAARC Centre concept proposed by Sri Lanka
- (4) Enhancement of PR and investment promotion activities in key target countries.

Action programmes for investment promotion are summarised in Table-7.

3.5 Medium-term and Long-term Priority Programmes

To achieve the export-oriented industrialisation of Sri Lanka, it will be necessary to develop and promote other industrial sectors in addition to the three sectors covered in the study. For the overall development and promotion of export-oriented industries in the future, the Government and related organisations should take the initiative in developing promotion programmes based on the key issues common to other industrial sectors.

Out of such promotion programmes, priority programmes for the medium and long term are formulated, based on common key issues and domestic plans by the Sri Lankan side. Basic concepts of priority programmes are shown in Figure-4. These programmes are desirable to be implemented on a priority basis. When implementing priority programmes, it is recommended that domestic and foreign resources be used to full advantage and that relevant organisations be coordinated in terms of resources and functions.

1) Development of Human Resources for Export Marketing

(1) **Background and Objectives:** Sri Lanka is stressing creation of export-oriented industries as a basic policy for its economic development and has designated the 1990s as the "Decade of Exports". There is a shortage of human resources for achieving this plan, however. It is becoming necessary to develop and train people in the Government and industry so that they are knowledgeable in international trade. At the present time, there are few organisations providing practical training in trade. The establishment of a Trade Training Centre (provisional name) or centre functions for training would be desirable in the medium to long term.

(2) **Implementing Organisation:** It appears to be appropriate that the centre will be set up under the Export Development Board (EDB), the central organisation for export promotion under the Ministry of Trade and Commerce, which covers a wide range of industries, including trade in services. At present, it would be difficult to establish a Trade Training Centre due to budgetary constraints. As a result, this project will be taken up in the medium and long term. In the short term, consideration should be given to strengthening and expansion of EDB facilities, etc.

(3) **Details of Programme:** Training should be primarily given to people in industry, but could also be given to the staff of Government organisations

administering the export promotion programmes. The training will cover the following areas:

- a) Practical trade know-how
- b) Export marketing
- c) Quality control, standardization, and inspection
- d) Design and packaging
- e) Area studies and foreign language training

(4) Action Plan: EDB will take the initiative in drawing up a basic concept, forming a consensus within the Government, etc. for the establishment of a Trade Training Centre. In addition to its trade training programme in Colombo, EDB will try to develop a large pool of personnel for export business through a programme of export awareness in rural areas, etc.

2) Promotion of Standardization and Quality Control (Strengthening of SLSI)

(1) Background and Objectives: Sri Lanka's policies for creation of export-oriented industries call for promotion of standardization and strengthening of testing, inspection, and metrology services for private business. Compliance with ISO 9000 (inspection and certification) and assistance to private companies for TQM activities are also needed.

(2) Implementing Organisation: National standards are administered by MIST and are promoted by Sri Lanka Standards Institution (SLSI) which was established in 1965. The latter organisation has built a new central laboratory (2,500 square meters) in Colombo. Further, it plans to build laboratories in regional areas too. These labs will serve the growing needs of regional areas as they develop. One laboratory has been built in Kurunegala, and three more are scheduled.

(3) Details of Programme: Standardization and quality control will be promoted through the following measures:

- a) Augmentation of testing, inspection and measuring equipment at SLSI's central and regional laboratories
- b) Compliance with ISO 9000 and promotion of TQM
- c) Invitation of foreign experts and overseas training for SLSI staff

(4) Action Plan: As for a) of the measures mentioned above, financial arrangement should be made for augmentation of equipment. Concerning b), an action programme should be formulated with advices by experts in TQM.

3) Prevention of Industrial Pollution and Promotion of Energy Conservation
(Expansion of CISIR)

(1) Background and Objectives: In the economic development policies of Sri Lanka, emphasis has been placed on industrial development. There has been substantial growth in the industrial sector in recent years as a result. However, while the need for monitoring and prevention of industrial pollution has been discussed, no specific measures have been devised. The general level of awareness of this among businessmen is low as well. The need is growing for quick measures to protect the environment, and in particular to prevent industrial pollution as well as promote industrial development. At the same time, it is necessary to encourage energy conservation.

(2) Implementing Organisation: To encourage coordination with the Central Environmental Authority (CEA), which is in charge of environmental protection policies, as well as to prevent industrial pollution, an Industrial Pollution Prevention Technical Centre (provisional name) or centre functions will be set up in Ceylon Institute of Scientific and Industrial Research (CISIR) under MIST.

(3) Details of Programme: Activities and functions of the centre will be as follows:

- a) Development and training of technicians for monitoring and prevention of industrial pollution
- b) Development of industrial waste management and treatment technologies and transfer them to private companies
- c) Promotion of energy conservation
- d) Installation of equipment for monitoring and prevention of industrial pollution

(4) Action Plan: For the time being, work should focus on achieving a consensus within the Government while at the same time drawing up a plan for implementation of the technical centre for pollution prevention.

4) Training of Management Personnel (Expansion of NIBM)

(1) Background and Objectives: It is becoming urgent to train managers for the development of Sri Lanka industry, and in particular to help create export industries in the future. National Institute of Business Management (NIBM), an

institute under MIST, is planning to expand its capabilities in training, to develop a Computer Aided Production Management (CAPM) system, etc. NIBM plans to set up a Productivity Centre (provisional name) or centre functions in the medium to long-term.

(2) Implementing Organisation: NIBM will be expanded.

(3) Summary of Expansion Programme

- a) Evolution of the productivity improvement training programme
- b) Training of management consultants
- c) Development and dissemination of CAPM

(4) Action Plan: Implementation plan for the expansion programmes above should be formulated with advises by experts in business management.

5) Improvement of Infrastructure

(1) Background and Objectives: When economic and social development, and in particular in the promotion of a strategy of creating export-oriented industries (including foreign direct investment), improvement of a proper infrastructure is an essential requirement. An infrastructure should be built over the medium and long term based on a master plan in such sub-sectors as power supply, transportation, and telecommunications.

(2) Implementing Organisation: There are many administrative organisations involved, but from the viewpoint of the creation of export-oriented industries, it is desirable that MIST, and in particular the Industrialisation Commission, take the initiative by taking full advantage of private sector resources, including foreign capital, in improvement of infrastructure.

(3) Details of Programme: Infrastructure, and in particular a stable supply of electric power, transportation (roads, shipping, and air freight), and telecommunications (telephones and telexes), should be improved. Improvements should be made in the reliability of services in addition to constructing the physical facilities.

(4) Action Plan: Plans for the improvement of infrastructure will be formulated and construction of industrial estates promoted. The industrial estate development programme recommended in this Study is in line with action plans for the improvement of infrastructure.

4. CONSOLIDATION OF METALWORKING INDUSTRY

4.1 Present Situation of Metalworking Industry

The present situation of the metalworking industry focused on the foundry industry and metalworking training centres is summarised below.

1) Present Situation

(1) Classification by ownership type, and major characteristics

Based on the socio-economic background of the country (i.e. colonial times when economy was influenced by plantation farming, independence after the Second World War, adoption of a mixed and market economy, and export promotion policy after 1977) and according to their type of ownership, metalworking enterprises in Sri Lanka can be classified into public enterprises, privatized public enterprises, enterprises owned by domestic capital (medium-scale and small-scale enterprises), joint ventures with foreign investors, and export enterprises operating in EPZs.

a) **Public enterprises:** Public metalworking enterprises are relatively large in scale and have abundant equipment and manpower compared to private enterprises. However, enterprises with little management autonomy do not have clear incentives for improvement of their plant capacity utilisation or export promotion and fail to utilise existing facilities and equipment. As a result, their modernization is heavily dependent upon foreign aid. In the event that public enterprises are accorded with management autonomy, it is desirable to conduct overall diagnosis of public metalworking enterprises and their potential market study by appropriate experts. Rapid privatisation of public enterprises is in progress. Thus, all public enterprises, with the exception of a few, will be privatized by the end of 1993.

b) **Privatized public enterprises:** For private enterprises which have recently been privatized, a major management challenge at this stage is to activate individual production divisions in order to maximize their economies of scale as a whole. If this succeeds, they will be able to substitute currently imported metalwork products and start to export in the foreseeable future. For this purpose, it is desirable to execute modernization and market exploration under assistance of appropriate experts. The ratio of private to public enterprises is changing according to

the ongoing privatisation initiatives. The share of privatized public enterprises will be so large that modernization of these enterprises is important for the development of the industry. Implementation of privatisation will be a starting point, not a goal, for industrial promotion.

c) **Medium-scale private enterprises:** Medium-scale private metalworking companies owned by domestic capital are, in general, keen to make investments for modernization. In fact, some of them have started or plan to start facility modernization, such as introduction of electric furnaces. A major issue facing these medium-scale enterprises is a shortage of competent engineers. Importantly, introduction of new machinery alone is not sufficient for rationalization or modernization of production facilities or practices. Once appropriate technical support is provided, the medium-scale enterprises will increasingly satisfy domestic demand and look for export markets in future.

d) **Small-scale private enterprises:** Privately owned small-scale metalworking enterprises are serving a sizable market, and many of them do not see any problem in their product quality. Standardization and other supportive measures will be required to modernize these enterprises.

e) **Joint ventures:** Most joint ventures except those in the export processing zone have investment plans and show expectation for future exports. To attract foreign companies with technology, capital, market and credibility continues to be important, and in particular strategic promotion focusing on selected industries is desirable.

f) **Enterprises in the export processing zone:** Metalworking enterprises are exporting tools, bolts and nuts to industrialized countries, while these products are imported from China and other countries in large quantities for domestic consumption. It is desirable to reinforce the linkage between domestic and export markets, as well as to transfer technology among industries in Sri Lanka.

(2) **Domestic market and exports/imports**

The market for metalwork products in the country is relatively small partly due to the small population and national income. There are few assembly companies (such as automobile and electrical appliance companies) thus the market for assembly parts is small, limiting the role of the metalworking industry

to the manufacture of maintenance and repair parts. Also, non-machinery metalwork products, such as tools, bolts and nuts, and sanitary metal products, are imported because domestic products manufactured outside EPZs do not have competitiveness in quality and price. This further limits the domestic market available for local manufacturers. The improvement of production techniques will enable them to explore domestic markets.

The total value of exports of metalwork products was Rs. 822 million in 1991, 76% of which was exported by enterprises operating in the export processing zone. Major export items from EPZs are tools, ornamental chains, and bicycle parts for industrialized countries. The largest item exported from areas other than EPZs are razors, printed cans, bottle crowns, and simple machinery such as agricultural machinery, weighing machines, sprays, and scraps.

Most of the metalworking enterprises want to export simple machinery, including agricultural machinery, metal furniture, and castings. The prospective markets for them are in Asia and Africa. It will be feasible that, with the upgrading of production techniques, non-machinery metalwork products will be exportable in the foreseeable future, in addition to import substitution. Other potential markets are ASEAN countries which may demand low-cost machine parts in future due to the increase in labor cost. However, the upgrading of production techniques in existing metalworking enterprises is the prerequisite to this. At present, a market study should be conducted to identify export potential of non-machinery metalwork products taking advantage of locational advantages.

(3) Production sharing (use of subcontractors)

Most metalworking enterprises own all necessary equipment, including casting, electroplating, and other special processes. At the same time, the questionnaire survey indicates that many companies have an interest in subcontracting work. While subcontracting has not been well developed yet, these companies expect benefits from development of such practices. Production sharing is critical for the modernization of the country's metalworking industry and development of production techniques. For this purpose, coordinated guidance and support activities are required, including evaluation and registration of potential subcontractors, and instruction for them in order to minimize the concern of consigning companies about the quality of a particular subcontractor. This is particularly important for electroplating operations which are carried out

on a small scale in many manufacturing plants which show a high risk of environmental pollution.

(4) Investment plan

The results of the questionnaire survey indicate that many metalworking enterprises have future investment plans. Regarding the future plan for improvement of production techniques, many enterprises emphasised the introduction of new machines and technical training, followed by employment of qualified technicians. Both public and private enterprises showed "strong interest in new merchandise or technology of foreign company" (85%). To attract investment from an appropriate foreign partner, it is important to focus on specific products and makers, rather than general promotional activities. Approaching selected foreign companies with detailed information on manufacturers and products would bring constructive results, as well as clarifying issues. A preliminary study prior to the start of the approach is also effective and recommended.

(5) Industrial estate for metalworking industry

At present, many metalworking shops in the country are located within residential areas. This makes expansion of their operation difficult, and they will not be able to operate at present location if environmental pollution becomes major public concern. Of the 23 enterprises responding to the questionnaire survey which show interest in moving to industrial estates, 19 respondents showed interest in future exports. This implies that industrial estates accommodating metalworking enterprises should be planned in strategic locations advantageous to exports. One possible solution is to accommodate metalworking enterprises in a metalworking park to be located in the industrial estates in the event that the relocation is acceptable to enterprises and is economically feasible.

(6) Government's industrial promotion policy

At present, the Government of Sri Lanka is implementing a wide range of programmes under the basic policy to introduce a market economy, including privatisation of public enterprises, export promotion, investment promotion (including attraction of foreign capital), creation of employment opportunities, improvement of trade balance, and the raising the standard of living. In particular, BOI has made a successful attempt to attract export industries, resulting in exports of metalwork products. This policy should be maintained in the future. For enterprises not registered in BOI, various incentives, such as tax

exemption, financing, and anti-dumping, have been extended when they are export-oriented and in the pioneer status for import substitution. However, it is noted that these incentives are legislated by many ministries.

Development of the metalworking industry will be strongly affected by private enterprises after most of the public metalworking enterprises are privatized. Development of private sectors is based on their own efforts. However, it is well suggested, by economic growth in NIEs and ASEAN countries, that governmental promotion policies affect the development of private sectors. The government is recommended to take the necessary measures to nurture the metalworking industry in the country since it is important for the national economy.

(7) Promotion of technical cooperation with developing countries

Some research institutes in Sri Lanka are developing technology suitable for local industries and environment, which seems to be useful for Southeast and Southwest Asia which have common background in natural environment and other aspects. Clearly, development of this "indigenous" technology has high potential for contributing to higher standards of living and industrial development in the country as well as neighboring countries. From this viewpoint, it is desirable to explore an opportunity for joint development and mutual use of technology within the region.

2) Present Situation of the Foundry Industry

In a study conducted by UNIDO/NIBM, 60 private foundries were identified. Of the total, 51 produced grey iron castings, 32 Al-base alloy castings, and 37 Cu-base alloy castings. As indicated above, many of them produced two or more types of castings.

a) Government-controlled foundries: Ceylon Steel Corporation (will be privatized), Sri Lanka Railways, and Government Factory have large production facilities, but their operating rates are very low due to low productivity caused by small local market and effective sales promotion.

b) Privatized foundries: Lankaloha (Enderamulla Foundry) is short of demand and it cannot efficiently utilise the largest and most advanced melting facility in Sri Lanka, which is partly attributable to the fact that they have not satisfied the demand for the ductile iron products.

c) Medium-scale foundries operated in private engineering enterprises: At present, around 20 foundries are still maintaining their vigor by manufacturing parts for agriculture machines and sewing machines, pumps, valves, and manhole covers. Unfortunately, however, production techniques used at these foundries are 40 years old, and some poor craftsmanship and techniques seem to have been inherited. The obsolete level of foundry processing technology is reflected in the fact that they do not have any outside organisation to rely on for technical assistance, nor experienced engineers to teach the latest techniques. Nevertheless, several foundries are looking to improve their production techniques. They have already installed or plan to install induction melting furnaces, shell molding machines, and other modern equipment. They are expected to achieve the fastest progress among foundries in Sri Lanka if appropriate advice and guidance are given. The first step is to raise foundry process technology to a level capable of handling modern equipment, otherwise investment would be wasted. It is desirable to establish a foundry technology training centre, in combination with diagnosis by experts and overseas training of engineers and technicians.

d) Small-scale private foundries: Although their level of foundry processing technology is low, they are not worried or concerned about their own technology or quality. Some of them want to improve production techniques and productivity but are not capable of doing so due to a lack of funds and/or technical assistance. Thus it is difficult for these small foundries to raise productivity and quality from the present level, until quality concern emerges and diffuses in the upper echelon of the industry to bring impacts on their attitude.

3) Present Situation of Metalworking Training Centres

Among metalworking processes, relatively advanced training is provided by some training centres for cutting, welding, and assembling. One problem is that these training centres are scattered in various ministries and may not satisfy demand effectively. This is reflected in the fact that trained people go overseas for work as they cannot find a suitable job in the country. The effective coordination of the training centres is desirable.

Regarding the foundry technology training centre, on the other hand, the quality of training in terms of processing, equipment, and operation is at a low level. Thus it does not have any effect in improving foundry processing technology. At present, the programme to upgrade the technology is in progress under assistance from UNIDO, and the Foundry Development Service Institute (FDSI) has been established as a private

organisation to manage the programme. However, UNIDO's programme is mainly concerned with the assignment of experts and the provision of testing equipment to IDB. On-the-job training in the use of advanced equipment is not envisaged. Consequently, the programme will not serve the purpose of improving production techniques required for modernization of medium-scale private enterprises. Establishment of a training centre equipped with an electrical furnace is required to provide on-the-job training on modern molding and finishing operations.

As for plating, IDB's training facility is old. The training centre will require installation of plastic plating, Al anodizing, electro forming, and waste water treatment facilities. These production techniques are required also for production of daily necessities. Also, it is desirable to provide a facility to give training in waste water treatment by industries other than plating.

The government is now planning to establish a metal mold training centre. At present, most electrical household appliances are imported as finished products, and it is reasonable to expect less demand for metal molds that require advanced production techniques, such as medium and precision plastic injection molds, press molds, and die casting molds. Thus, the establishment of mold training centre seems to be premature.

4.2 Promotion of Metalworking Industry

Development of the metalworking industry is envisaged to have various economic effects. Further, some products of the metalworking industry are suitable for Sri Lanka to become competitive if their technical level is upgraded. While self-help efforts of private enterprises hold the key to successful development of the metalworking industry, the Government's appropriate measures to nurture growth of the industry is equally important.

1) Need for Fostering Metalworking Industry

The fostering of the metalworking industry is very important as it brings the following positive impacts on economic development of Sri Lanka:

- a) Development of the metalworking industry as an integral element of secondary industry has been playing a crucial role in economic development of many countries, because it supports all industries as well as the daily life of people by supplying necessary products. In other words, the metalworking

industry serves as a starting point for a rise in national income and modernization of the country.

b) In Sri Lanka, the food processing and textile industries account for significant portions of employment in the manufacturing sector, and they generally employ female workers. In contrast, the metalworking industry mostly requires male employees and this will help to rebalance the employment structure.

c) At present, Sri Lanka imports large quantities of metalwork products, which put pressure on the country's balance of payments. If the quality of locally-made metalwork products is improved, current imports can be substituted. Also some of these products may be exported. Thus development of the metalworking industry contributes greatly to improvement of the country's balance of payments.

2) Competitiveness of Metalworking Industry

Open market policy since 1977 has caused a shrinkage of domestic production and expansion of imports because most domestic metalworking industries were under political protection and thus unable to compete with imported products in both quality and price. Due to domestic market restrictions, it is uneconomical to produce some products although they have market competitiveness. This is evident from the fact that some metalworking enterprises in EPZs export their products to developed countries.

As metalworking industries (including the foundry industry) are labour intensive, their production base shifts from time to time from one country to another due to cheaper labour costs. Investment environment in terms of the labour force in Sri Lanka is advantageous due to relatively cheap labour costs, high educational levels, a hard working labour force and easy English communication. Having locative advantage for Middle Eastern, Southwest Asian and Southeast Asian markets, upgrading the quality of Sri Lanka's metalworking products for export would be of benefit. Points and measures for strengthening market competitiveness will come from analysing the import structure and export market of metalwork products (excluding machinery at this stage).

3) Consolidation of the Metalworking Industry

As privatisation of public metalworking enterprises continues, the future development of the metalworking industry will fully depend on how active private enterprises become. It is obvious from the history of economic success in NIEs and ASEAN countries that effective promotion policies urge the development of private

enterprises. Besides, there is no doubt that private enterprises have been a prime factor for economic development of the countries.

Firstly, the Government should strengthen the fostering of the metalworking industry, recognizing that it is important to the national economy. It is then necessary for the Government to establish a unit specialized in the metalworking industry in MIST. The Government should implement the existing promotion policies, carry out mutual adjustment among ministries, and plan and implement policies for promotion of the industry. It is recommended that the Government nurture private industrial associations and have direct communication with it for implementing promotion policies.

4) Promotion Measures

Measures to be taken for promotion of the metalworking industry are summarised in Table-8.

5) Action Programmes

For promotion of the metalworking industry, it is recommended that the Government follow the action programmes presented in Table-9.

4.3 Promotion of Foundry Industry

1) Foundry Production and Demand Outlook

Foundry production in Sri Lanka is expected to reach 12,000 tons by private foundries, or 14,000 tons by all (private and public) foundries by 1993. This is equivalent to 0.8 kg per capita if the country's population is assumed to be 17 million. It is reasonable to assume that casting demand will increase significantly with future industrial development in order to supply materials to a wide range of industries.

a) Import substitution: Import substitution is a primary source of spurring demand for castings. From current imports of machinery parts and other metalwork products, domestic casting demand is estimated at 4,000 tons/year. If technological improvement is made, possible import substitutive products will include: 1) sewing machine arms and beds; 2) molds for glass production; 3) manhole covers; 4) pumps; 5) grinding media for cement production; 6) hull steel castings; 7) steel castings for railway; 8) copper castings including taps, cocks, valves, and fittings; and 9) copper alloyed casting valves.

b) **Market expansion:** The second step to boost casting demand is to regain demand for (i) shipbuilding materials, (ii) PVC pipes, and (iii) other machinery, which has been replaced with welded structural members and plastic products. This again requires castings to be improved in quality and price.

c) **Exports:** Castings sales require the manufacturer's reliable quality control system and mutual trust based on long-standing relationships. As inspection of castings is costly and establishing standards is difficult, export of castings, except for specific products such as parts of machined castings, assembled units, or machinery, will be difficult. After taking this into account, medium-scale foundries in private engineering enterprises are expected to play an important role.

2) Improvement of Foundry Process Technology

From the field survey on foundry factories and user companies, various technical issues and recommended improvement measures were identified as shown in Table-10.

a) **Foundry technology training centre:** The proposed foundry process training centre will require a model foundry which has an integrated foundry process from pattern making, sand preparation, and molding, to melting, pouring, finishing, testing, and inspection. The facility will be used to provide on-the-job training for engineers and technicians, while giving an opportunity for foundry managers to learn about day-to-day management of foundry processes. In addition to training, the model foundry should be designed to manufacture and sell various products, including ductile cast iron, alloyed cast iron, and steel castings, on a commercial basis to cover maintenance costs and the costs of equipment required in the future. This will provide an opportunity to learn about the cost accounting system at foundries and help understand how productivity, metal yield, and defective rate affect manufacturing costs in the field, for better foundry operation and management.

b) **Reinforcement of diagnosis service:** This is effective in improving the level of production techniques at existing foundries and learning practical knowledge.

c) **Emphasis on overseas training:** It is important to promote overseas training to learn what is needed to develop the country's foundry industry into a world class industry through lectures and practical training overseas.

5. INDUSTRIAL ESTATES DEVELOPMENT PLAN

5.1 Alternative Sites of Industrial Estates

For the development of the new industrial estates, it has been agreed that the study will be made on three alternative sites; (i) Atherfield site, (ii) Martin site, and (iii) Sirigampola site. In addition to these alternative sites, two more alternative sites have been proposed in view of access to the highway network to be developed in and around Colombo city. The fourth alternative site is Ekala which is located half way along the proposed Colombo-Katunayake highway and the fifth alternative site is Katana located in the vicinity of Katunayake airport (Refer to Figure-5). Major conditions at each alternative estate site are briefly summarised as follows:

1) Atherfield Site:

The land (168 ha in gross) is owned by the State, and it is readily available for the development of an industrial estate. One advantage of this site is that water is available from the Kelani river running along the northern corner of the estate. Although industrial effluent could be returned to the Kelani river by installing a sewage treatment plant, it is recommended to locate industries less pollutant to water quality at this site. On the other hand, one disadvantage is that the land undulates and a relatively large volume of earthworks are required.

2) Martin Site:

The land (137 ha in gross) is owned by the State, and it is readily available for industrial estate development. The land is flat, but it is subject to periodic floods. A relatively large volume of earthworks will be required for flood protection. Due to intrusion of saline water into the Deduru river running along the estate, water should be taken at a site about 5 km upstream from the estate. Martin site, located about 80 km north of Colombo, is not favored in regard to access to and from Colombo city.

3) Sirigampola Site:

The land is owned by a farmers' trust, and MIST has informed that acquisition of this land is difficult. Development of an industrial estate at this site is, therefore, unrealizable in the foreseeable future.

4) Ekala Site:

Access to the highway, port, and airport is ideal at this alternative site. However, the land is partly owned by private farmers and it requires a large volume of earth filling in the marshy land areas. Measures should be taken to improve the retarding basin in the flood area and to obtain sufficient water supply sources for the estate.

5) Katana Site:

The land (59 ha in gross) is owned by the State, and it is readily available for industrial estate development. The land is flat with coconut plantation (44 ha) and paddy field (15 ha). Katana site is located about 4 km north of Katunayake airport, and it is favored in regard to access to and from the airport and Colombo port. Water for Katana site should be taken from the Maha river and a 10km conveyance pipeline will be necessary.

5.2 Investment Demand

Investment demand for the development of industrial estates has been studied through an interview survey in Sri Lanka and mail questionnaire survey in Japan.

	Sample	Answered	Rate
Sri Lanka (interview survey)	562	562	100 %
Japan (mail questionnaires)	2,000	279	14 %

1) Investment Demand in Sri Lanka

Out of 562 enterprises interviewed in the course of this study, 66 enterprises (11.7 %) showed interest in locating their factories in one of the alternative estate sites. By type of industries, they are classified as summarised below.

Categories	Sample	Interested	Rate
Garment/apparel	99	16	16.2
Gems/jewellery	57	2	3.5
Rubber-based products	49	12	26.5
Fabricated metal processing	70	8	11.4
Others(food,plastic,metal,etc.)	287	27	9.4
Total	562	66	11.7

By location of industrial estates, the interview survey disclosed that preferences were given as follows:

Categories	Atherfield	Martin	Sirigampola	Total
Garment/apparel	12	4	2	18 (16)
Gems/jewellery	2	0	0	2 (2)
Rubber-based products	11	3	0	14 (13)
Fabricated metal processing	5	4	2	11 (8)
Others	15	12	1	28 (27)
Total	45	23	5	73 (66)

Remark: Figures in parentheses indicate the net number of interested enterprises as some multiple answers were received in the interview survey.

As indicated in the above table, Atherfield site draws the most attention of potential investors. Preference in locating in Atherfield site is mainly attributable to:

- i) Cheaper labor cost available in rural areas
- ii) Availability of raw materials in specific categories of industries

A major number of enterprises interested in locating their factories in the industrial estates expect that their products will be exported. Likewise, they are willing to set up new factories in joint venture with foreign investors. Japanese investors are most favored as partners for joint ventures, followed by US and European investors.

2) Investment Demand by Japanese Enterprises

Out of 279 effective replies to the mail questionnaire survey in Japan, 33 enterprises (11.8 % of effective replies or 1.65 % of the total sample) noted that investments in industrial estates in Sri Lanka are "worth studying". By industrial category, they are mainly electrical and general equipment, and chemical industries. 26 enterprises, out of 33 replies, envisage direct investments. About half of the interested enterprises are willing to invest in the form of a joint venture. Almost all of them are contemplating to export their products, as they have less expectations in the domestic market. It is noted, however, that subsequent interviews with the 33 enterprises indicated that only one company was keenly interested in investment, and 7 firms were interested in such a way that they would consider investment under some conditions or in a longer time range for investments.

3) Investment Demand by Other Countries

Investment demand by other countries other than Japan has been analyzed on the basis of the relationship between Japanese investment and other foreign investment in Sri Lanka in the past. The investment demand in other countries is presumed as summarised below.

ISIC	Category	NIEs	EC/USA	Total
3220	Apparel	6	5	11
3560	Plastic	3	2	5
381	Metal product	1	1	2
383	Machinery	3	9	12
390	Others (toy, etc.)	24	24	48
	Total	37	41	78

4) Potential Investment Demand

It is evaluated that the investment demand in Sri Lanka is sufficiently high in promoting the development of industrial estates. Investment demand of Japanese enterprises has been evaluated to be relatively low, due partly to the recent recession in Japan. It is presumed, however, that the investment demand in Japan would be enhanced after the recession is over in the near future. Investment from NIEs countries and USA/Europe is expected at a higher rate than investments from Japan. In general, the potential demand for investment is evaluated to be sufficient for development of small to medium scale industrial estates in Sri Lanka.

5.3 Basic Plan of New Industrial Estates

1) Type of Industries and Demand for Development

The type of industry to be located at each of the five alternative sites should be planned taking into account the respective conditions such as transportation, availability of water, availability of labor, and the physical and social environment. For each site, it is presumed that industries would be located as follows:

	Atherfield	Martin	Sirigampola	Ekala	Katana
1. Food	0	0			
2. Apparel/garment	0	Δ (dyeing)			
3. Tannery/leather		0			
4. Rubber products	0				
5. Chemical products		0			
6. Fabricated metal products		0 (plating)		0	0
7. Machinery			0	0	0
8. Gem and jewellery	0			0	
9. Light industry (Toy, sports goods, etc.)	0			0	

In the light of the result of the investment demand survey, the number of investments and factory lot areas at each alternative site have been presumed as tabulated below.

ISIC	Atherfield		Martin		Sirigampola		Ekala		Katana	
	No. of investors	Factory Area (ha)	No. of investors	Factory Area (ha)	No. of investors	Factory Area (ha)	No. of investors	Factory Area (ha)	No. of investors	Factory Area (ha)
1. Food	2	1.5~3.0	1	10.0	-	-	-	-	-	-
2. Textile, Apparel	21	15.0~25.0	3	3.0~6.0	-	-	-	-	-	-
3. Leather	-	-	31	24.5~31.0	-	-	-	-	-	-
4. Rubber products	11	10.3~20.5	2	2.0~4.0	-	-	-	-	-	-
5. Chemical products	-	-	15	12.7~23.5	-	-	-	-	-	-
6. Fabricated metal	-	-	5	5.5~10.5	-	-	5	2.5~5.0	10	8.0~15.5
7. Machinery	-	-	-	-	23	23.0~46.0	28	28.0~51.0	28	28.0~51.0
8. Gems	14	8.0~16.0	-	-	-	-	14	8.0~16.0	-	-
9. Light industry (toy, sports goods)	12	6.0~12.0	-	-	-	-	28	22.0~44.0	-	-
10. Others	2	2.0~4.0	1	0.3~0.8	-	-	-	-	-	-
Total	62	42.8~80.0	58	58.0~85.3	23	23.0~46.0	75	60.5~116.0	38	36.0~66.5

At Atherfield site, demand for factory lots would reach 42-80 ha, and such industries as garments/apparel, rubber-based products, gems/jewellery, and light industries would be located there. At Martin, factory lots of 58-85 ha would be utilised for tannery/leather products, chemical products, etc. At Sirigampola, demand for factory lots would be smaller than 50 ha, and fabricated metal product and machinery would be located

there. At Ekala, factory lots of over 60 ha would be utilised for machinery, electronic industry, gems/jewellery, and such light industries as toys, and sports goods. At Katana, factory lots, of 36-66 ha would be utilised for non-polluting type metalworking industry and machinery, electronic and precision equipment industry.

2) Land Use Plan

In view of the demand for factory lots, as well as in the light of geographic and other natural conditions at each alternative site, a land use plan has been worked out as illustrated in Figure-6 to Figure-10, and as tabulated below.

	(Unit: ha)					
	Atherfield	Martin /4	Sirigampola	Ekala	Katana	
1. Factory lot	71.6	83.9 (28.5)	34.5	93.4	44.0	
2. Residential area	3.8	6.6 (0.0)	6.7	21.0	-	
3. Road	7.7	7.5 (3.0)	4.2	11.8	4.1	
4. Utility /1	3.5	16.2 (10.3)	8.2	6.7	1.7	
5. Facility /2	7.5	7.3 (3.1)	13.4	15.2	4.0	
6. Others /3	73.5	15.1 (1.0)	177.8	34.4	5.2	
Total	167.6	136.6 (45.9)	244.8	182.5	59.0	

Remarks: /1 UtilityWater purification plant, Sewage treatment plant, Electric sub-station, Telecommunications centre, Solid waste disposal site.

/2 Facility....Industrial park centre, Training centre, Park

/3 OthersReserved area for future expansion, Buffer green, Retention pond, etc.

/4 Figures in parentheses indicate area to be developed in the first stage.

3) Facility Plan

A relatively large volume of earthworks will be required at Atherfield, Martin, and Ekala estate sites. At Atherfield, cutting of steep slopes is required and it is necessary to work out a plan to balance the volume of cutting and filling in order to economize the cost of earthworks. At Martin, Ekala, and Katana, filling is required in order to protect the land from flooding.

Facilities required for roads, water supply, sewerage, drainage, power supply, and telecommunications systems at each alternative site are summarised as shown in Table-11.

In addition to the basic facilities and infrastructures, it is proposed to provide adequate facilities to enhance the attractiveness to investors as well as workers in the

estates. Such facilities as a) industrial estate centres, b) residential areas, c) training centres, and d) parks, are envisaged to be provided.

4) Implementation Schedule

In view of the investment demand, Atherfield estate site and Katana estate site would be developed in the short term. Industries would be distributed in accordance with their characteristics of industrial location. At Martin, development of the first stage (46 ha) in the western part of the estate would be carried out for relocation of tannery and leather industry as promoted by MIST-UNIDO, as far as the environmental conditions are permissible. Development of Sirigampola and Ekala sites is precluded due to difficulty in land acquisition.

For the purpose of evaluation, it is presumed that each industrial estate would be developed in accordance with the following implementation schedule.

Site	Short-term (1996~1999)	Middle-term (2000~2010)
Atherfield	1996 open ██████████	
Martin	1st Stage ----- (Tannery, etc.)	2nd Stage -----
Katana	1996 open ██████████	

5) Organisation for Implementation

For implementation and management of the proposed industrial estates, it is proposed to set up a new public corporation with participation from MIST and the private sector. As a participant from the private sector, it is conceivable to invite Lanka Industrial Estate Ltd. (LINDE) to be a part of the implementation agency. The management agency of the industrial estates should be subcontracted to the private sector. LINDE will also be a candidate for the management subcontractor.

6) Construction Cost

Total construction cost, including preparatory work, main work, land compensation, administration and engineering, physical and price contingencies, has been estimated for each alternative site as summarised below.

	Foreign Currency	Local Currency	Total	
	(US\$ million)	(Rs. million)	(Rs. million)	(US\$10 ⁶ equiv.)
Atherfield	16.55	265	963	(22.82)
Martin (1st stage)	8.88	152	527	(12.49)
Martin (2nd stage)	13.43	257	827	(19.60)
Katana	7.01	156	451	(10.69)

Remark: Inclusive of Physical Contingency (10 %) and Price Contingency (5 %/year)

5.4 Evaluation of Industrial Estates Plan

1) Environmental Aspect

The major environmental concerns in the establishment of the industrial estates are *water pollution, air pollution, and solid waste disposal*. For prevention of water pollution, each industrial estate will be equipped with a sewage treatment plant which will be designed to satisfy CEA requirements concerning BOD, SS, and other standards. Additional environmental assessment will be required at Martin estate. It is also noted that the treated water from Atherfield estate will be disposed into the Kelani river, and, thus, water pollutant industries should not be located in Atherfield.

Each estate will also be equipped with an incinerator for solid waste disposal. After incineration, remaining ash and incombustible waste will be transported to the adjacent final disposal area for sanitary filling so as not to cause any problems such as offensive odors, flies and other insects. Air pollution by incinerator will not be appreciable. Judging from the type of industries to be located in the proposed estates, it is unlikely that air pollution will cause any serious problems in the proposed estates.

2) Financial Evaluation

Financial viability for the establishment of the new industrial estates has been evaluated through analysis of the Financial Internal Rate of Return (FIRR) and repayability. On the assumption that the estates are occupied by factories in three (3) years and the factory lots are rented at the rate of \$3/m²/year, FIRR of Atherfield estate, Martin estate, and Katana estate has been calculated as follows:

Atherfield estate	:	FIRR = 8.9%
Martin estate	:	FIRR = 8.2%
Katana estate	:	FIRR = 9.4%

The calculated value of FIRR implies that the financial arrangement by a concessional term loan will be required for the establishment of the industrial estates. It is further noted that some financial support will be required in the event that the rent is lowered than \$3/m²/year or FIRR is to be enhanced to exceed 10%.

3) Economic Evaluation

Economic Internal Rate of Return (EIRR) has been calculated on the basis of wages payable to workers employed in foreign factories and income to be accrued from the lease of foreign factory lots. EIRR of Atherfield estate, Martin estate, and Katana estate has been estimated as follows:

Atherfield estate	:	EIRR = 35.9%
Martin estate	:	EIRR = 13.2%
Katana estate	:	EIRR = 23.0%

EIRR values are well over the opportunity cost of capital in Sri Lanka, and the implementation of industrial estates at these alternative sites are evaluated to be economically justifiable.

5.5 Recommendations for New Industrial Estates Development

1) Overall Evaluation

From a technical point of view, no particular difficulty exists in the implementation of the proposed industrial estates. In terms of economic feasibility, benefits are large enough to justify their implementation. Environment and social conditions will be preserved if the Project is implemented according to the laws and regulations applied in the country, as well as the plans and recommendations given in this Study.

Financial viability will not be substantially high due to the relatively high unit cost of construction and the relatively low leasing price set to be competitive with other industrial estates and EPZs in neighboring countries. It is essential, therefore, that a concessional term loan be taken out so that the Project will be financially viable.

2) Industrial Estate Development by Type of Industries

The proposed industrial estates have locational advantages and disadvantages which vary according to the types and categories of the industry to be located. Therefore, industries should be encouraged to locate in the most suitable site. In Atherfield estate, industries in the categories of garments and apparel, gems and jewellery, rubber-based products, and light industries will be invited. In Katana estate, electronic industries, fabricated metal and machinery industries will be invited. It is recommended that Atherfield estate and Katana estate be implemented in the first stage, securing an external loan on concessional terms. Implementation of Martin estate will be programmed in accordance with the UNIDO cooperation envisaged at this estate.

3) Assurance of Cost Recovery

Factory lots in the existing EPZs and industrial estates have been leased to enterprises at a low rate by means of Government subsidies, however, this has meant that the cost of construction, operation, and maintenance of the estates has not been recovered by incomes from the lease. In line with the Government policy for privatisation and in view of the lease rates in neighboring countries, it is desirable that the lease rate will gradually be raised so that the cost incurred can be recovered.

4) Investment Incentives and Improvement of their Application

The investment incentives which are currently applicable to foreign investors are quite competitive if compared with those in neighboring countries. It is recommended that the incentives be kept at the current level, their application be maximized, and that the formalities be expedited and simplified. For instance, maximum period of tax holidays should be granted to the investors in the industrial estates.

5) Strengthening and Diversification of Industrial Structures

The foreign investors currently located in Sri Lanka are predominantly of labor intensive type, most of them belonging to the apparel industry. They mainly employ young female workers and labor supply and demand for these workers is tight in the areas of Katunayake EPZ. To strengthen the industrial structure in Sri Lanka, it is recommended that diversified industries be introduced to the industrial estates, including resource based industries, high value-added type industries, industrial relocation type industries, and basic material type industries.

6) Reinforcement of Infrastructure Facilities

The development level of infrastructures in Sri Lanka still remains relatively low, particularly power, telecommunications, and transport facilities. In order to accelerate the investment by foreign and local enterprises, it is essential to upgrade these facilities. Without improvement in these infrastructures, the accelerated development of the industrial sector would not be attainable in Sri Lanka

7) Publicity of Investment Climate

The majority of Japanese investors selected for the mail questionnaire and interview survey did not have sufficient information and knowledge about the investment climate in Sri Lanka. Dissemination of this information is prerequisite to attract foreign investors. It is recommended that the investment promotion activities be further strengthened, and that the investment in the industrial estates be promoted as a part of the overall promotional activities.

8) Alleviation of Adverse Effects

Measures should be taken to alleviate all the adverse effects which might be caused by the implementation of the industrial estates. With regard to the environment, appropriate facilities should be constructed and operated according to the law and regulations applicable in Sri Lanka so that all the effluents and emissions from the industrial estates meet the regulations. Particularly, water polluting type industries should not be invited to Atherfield industrial estate to prevent pollution of the Kelani river. In any case, the effluent standards currently applied by CEA should be strictly observed and the quality of the effluents should be periodically monitored in operating the industrial estates.

9) Role of Regional Development

Among the proposed sites, Atherfield is located inland and away from the centres for national development. Local resources are available around the proposed estate and the estate development should be so planned that it will assume the role of stimulating the regional economy through industrial linkage between the manufacturing industries in the estate and the primary industry around the estate. Generation of employment will also have a great impact on the economic development of the region. It is partly attributable to these impacts that Atherfield estate has been recommended for the first stage implementation.

6. OVERALL RECOMMENDATIONS FOR INDUSTRIAL SECTOR DEVELOPMENT

Through in-depth study on export and investment promotion (Chapter 3), consolidation of metalworking industry (Chapter 4) and industrial estates development (Chapter 5), a large number of recommendable programmes for development have been elaborated in respective sub-sectors of this study. The study, at the same time, worked out some other recommendations that are not necessarily peculiar to the respective sub-sectors but equally important in developing the industrial sector as a whole. These recommendations are additionally noted below and they should be also taken into consideration in promoting industrial sector development in Sri Lanka.

1) Recognition of Crucial Importance of Industrial Sector Development

Sri Lanka's GDP attained an average annual growth rate of 4.1% in 1982 - 87 and 4.0% in 1989 - 91. In order to achieve a similar or higher GDP growth rate in the future, when it is expected that the growth rate and employment opportunities in the agricultural sector would decline, it should be publicly recognized that the industrial sector should be developed at a much higher rate of growth than it has been achieved in the last decade. As pointed out in Section 2.1, the contribution of the industrial sector to the national economy in Sri Lanka is still relatively low if compared with the ASEAN standard. Although the export value of industrial products has more than doubled over the last three years, the exports of non-traditional industries should be further promoted in an accelerated manner. It should be recognized that overall economic development is not attainable without accelerated development in the industrial sector, and that the industrial sector development is a decisive key for the economic development of Sri Lanka. Under this public recognition, MIST and other ministries concerned should deliberately follow the strategies for industrialisation published by MIST and the recommendations elaborated in this study.

It is additionally noted that political and social stability is of paramount importance for the promotion of foreign investment in the industrial sector, as it was pointed out in the questionnaire survey conducted in this study. The Government and people of Sri Lanka should universally recognize that political and social stability should be consistently maintained not only for the industrial sector development but for the social and economic development of Sri Lanka.

2) Follow-up of Industrial Development Policy

As noted in Section 2.4, MIST published "A strategy for Industrialisation in Sri Lanka" and is promoting industrial development in line with this strategy. It is noted, however, that this development policy published is rather general in nature and it does not deploy concrete programmes to be followed by the widely distributed authorities concerned. Through this study, various action programmes have been proposed in the short, medium, and long term for the export and investment promotion sub-sector and the metalworking industry sub-sector, as well as for the industrial estate development sub-sector. In this context, it is desirable that the action programmes be worked out for other sub-sectors as well, so that the authorities concerned will follow in a more concrete way. Institutional follow-up will also be required so that the responsibility to execute the proposed action programmes will be fixed to each authority concerned and the progress in their execution will be monitored periodically.

3) Promotion of Privatisation

Privatisation promotion policy is widely accepted in the industrial sector development. The various recommendations and action programmes proposed in this study are, in general, based on this policy. Some public supporting services are recommended with a view to activate the private sector and promote privatisation. In this regard, it should be emphasised that the private sector or privatized enterprises should not be neglected, but they should be organised into industrial associations by categories of industry, so that public supporting services and guidance can be effectively extended. Without public supporting services and guidance, sustainable development of the private sector would not be attainable. Strengthening of public supporting services and guidance will be realized by making use of the existing organisations and by enlarging their functions, if necessary.

4) Coordination among Authorities Concerned

A large number of ministries and institutions are concerned with the development of the industrial sector, and coordination among these authorities concerned needs to be greatly improved. A lack of coordination will result in inefficiency and a waste of limited resources, and it will cause problems in the execution of industrial development policies and action programmes. It is therefore suggestible that institutional improvement be promoted for the accelerated industrial development. In the event that the institutional restructuring is not attainable in the short term, it is unreservedly recommended that the Industrialisation Commission organised under MIST be strengthened institutionally so that

it will take initiative for coordination and harmonious execution of the industrial sector development. It is noted further that coordination and cooperation among the authorities concerned are prerequisite in carrying out various action programmes recommended in this study.

5) Initiatives to be Taken by Authorities Concerned

In the promotion of the industrial sector development, the authorities concerned in Sri Lanka should take initiative and assume a posture of self-help, without reliance upon foreign intervention. Such an initiative is required in requesting assistance and cooperation from foreign countries. In executing various action programmes proposed and recommended in this study, it is desirable that Sri Lanka take initiative in the preliminary discussion and in representing the consensus of opinion throughout the authorities concerned with respect to the priority to be accorded to each programme.

6) Comprehensive Development of Infrastructure

As noted in Section 3.5, improvement of infrastructure is crucially important for economic development of Sri Lanka, and for industrial sector development in particular. In view of the fact that development of infrastructure, such as stable power supply, highway networks, and telecommunications networks, has lagged behind, it is necessary to accelerate the improvement of these infrastructures in a more strategical manner. Besides, it is desirable that the improvement of infrastructure be planned and executed from a wider point of view. For instance, planning of a highway network improvement should envisage an industrial and other land use plan, as well as zoning along the highway, and it should be universally recognized by the ministries and institutions concerned. Such comprehensive development planning is particularly important in achieving efficiency in development and in representing the consensus throughout the authorities concerned.

7) Promotion of Environmental Conservation

Most of the existing factories in the Greater Colombo Area are disorderly located, and environmental regulations set forth by CEA are not always observed. Industrialists are, in general, less conscious of environmental conservation. As noted in Section 3.5, it is proposed to set up an industrial pollution prevention technical centre in the Ceylon Institute of Scientific and Industrial Research (CISIR). This proposal is one of the measures to be taken for environmental conservation, however, it will not offer a total solution in this respect. It is conceived that the disorderly located industries will be relocated to industrial parks equipped with facilities for prevention of pollution, as was the

case of UNIDO-MIST sponsored relocation of tannery and leather industries to Martin estate. Relocation and collective location of industries should not always be limited to the industrial estates proposed in this study. Some other industrial parks may be additionally set up in the industrial zones to be defined through land use planning. It is desirable that public institutions and private enterprises take appropriate measures for the promotion of environmental conservation.

8) Financial Support for Sectoral Development

Installation of facilities for prevention of pollution and relocation of industries for environmental conservation will require financial arrangement and support. Likewise, consolidation of metalworking industries as proposed in Sector 4.2 and 4.3 will be desirably promoted together with financial support. It is conceived that such financial support will be extended to the industrialists on more concessional terms and conditions than the ordinary loans currently available in Sri Lanka. It is conceivable that a fund for such a financial intermediary loan on concessional terms will be raised through cooperation of foreign financial agencies. In this respect, it is recommended that a more definite study be conducted to formulate a scheme for financial support in the industrial sector.

TABLES

Table-1 Study Team and Counterparts

Name	Position	
STEERING COMMITTEE		
Mr. A. S. Jayawardena	Chairman,	MIST - Secretary
Mr. K. Austin Perera	Member,	MIST - Addl. Secretary
Mr. S. Weerapura	Member,	MOF - Dty. Director
Mr. B. H. Passaperuma	Member,	MOF - Dty. Director
Mrs. C. Chitra Perera	Member,	MPPI - Dty. Director
Mr. S. C. Fernando	Member,	MHTI - Dty. Director
Mr. P. G. Ratnayaka	Member,	MTRID - Addl. Secretary
Mr. P. G. Nagahawatta	Member,	MHC - Director
Mr. G. L. Perera	Member,	BOI - Director
Mrs. M. Pandithasekera	Member,	EDB - Director
MIST COUNTERPARTS		
Mr. Luxman Siriwardena	Director, Investment & Finance	
Mr. Keerthi Senaratne	Dty. Dir., Investment & Finance	
Mr. Roy Jayasinghe	Director, Institutional & Infrastructure	
Mr. S. Ediriwickrama	Director, Trade & Export Promotion	
Mr. M. Susiriwardena	Director, Research & Information	
JICA STUDY TEAM		
Mr. H. Koizumi	Team Leader	(Nippon Koei)
Mr. M. Akagawa	Sub-Leader	
	Industrial Planner	(Nippon Koei)
Mr. I. Asakura	Industrial Planner	(Nippon Koei)
Mr. M. Nakada	Electrical and Telcom.	(Nippon Koei)
Mr. K. Okazaki	Water supply - Sewerage	(Nippon Koei)
Mr. Y. Gotanda	Infrastructure Designer	(Nippon Koei)
Mr. T. Shoji	Environment Analyst	(Nippon Koei)
Mr. Y. Mikami	Sub-Leader,	
	Metalworking Expert	(UNICO)
Mr. Y. Miyazaki	Metalworking Expert	(UNICO)
Mr. M. Yamauchi	Economist	(UNICO)
Mr. K. Yamazaki	Sub-Leader	
	Market Analyst	(JETRO)
Mr. Y. Fujimura	Investment Promotion Expert	(JETRO)
Mr. K. Ishikawa	Export Promotion Planner	(JETRO)

Table-2 Implementing Organisations for Export and Investment Promotion

Abbreviation	Full Name	Administration Authority	Major Roles
1. Ministries			
MIST	Ministry of Industries, Science and Technology (Industrialisation commission)	(MIST)	Administration of Industries, Science and technologies (Coordination of Industrial and investment policies)
MTC	Ministry of Trade and Commerce		Administration of trade and commerce
MHTC	Ministry of Handlooms and Textile Industries		Administration of textile and apparel industries
MHE	Ministry of Higher Education		Administration of higher education
2. Governmental Organisations			
EDB	Export Development Board	MTC	Export promotion
BOI	Board of Investment		Investment promotion (former GCEC)
IDB	Industrial Development Board	Ministry of Tourism and Rural Industrial Development	Development of small and medium scale industries
CITI	Clothing Industry Training Institute	MHTI	Training of workers for apparel industry
TTSC	Textile Training and Service Centre	MHTI	Training of workers for textile industry
SGC	State Gem Corporaton	Ministry of Finance	Promotion of gems and jewellery industry
RRI	Rubber Research Institute	Ministry of Agricultural Research and Development	Research and development of natural rubber and rubber-based products
SLSI	Sri Lanka Standards Institution	MIST	Promotion of standardisation
CISIR	Ceylon Institute of Scientific and Industrial Research	MIST	Scientific and industrial research and development
NIBM	National Institute of Business Management	MIST	Training of management and productivity personnel
CEA	Central Environmental Authority	Ministry of Environment	Environmental Protection

Table-3 Action Programmes for Promotion of Garments and Apparel Industry

Programme	Implementing organisation	Action/Activity		
		Follow-up	Short-term (1 to 3 years)	Medium and long-term (4 years or more)
1. Short-term programmes				
[1] Strengthening of export promotion activities • Collection and supply of overseas market information • Participation in exhibitions • Hosting of seminars • Dispatch and reception of missions • Market development	EDB SLAEA Overseas Sri Lankan embassies	• Confirmation of key markets • Formulation of annual plans for export promotion activities • Deliberations with related domestic and foreign organisations • Selection of companies to be assisted	• Implementation of export promotion activities aimed at key markets	
[2] Expansion of CITI and Moratuwa University • Training in sewing skills for garments and apparel • Fostering of textile and apparel/garment technicians	MHTI CITI Moratuwa University	• Finalisation of plan for development of human resources and expansion of training • Deliberations with related domestic and foreign organisations	• Development of human resources and expansion of training • Invitation of foreign experts	
[3] Technical and managerial improvement of companies • Invitation of foreign experts • Roving guidance of factories • Hosting of seminars	EDB IDB	• Invitation of foreign experts • Selection of companies to be given roving guidance	• Roving guidance by experts for improvement of technology and management	
[4] Promotion of foreign investment and technical tieups • Garments and apparel • Fabrics and auxiliary materials	BOI EDB Overseas Sri Lankan embassies	• Preparation of action plan for promotion of foreign investment and technical tieups	• Promotion of foreign investment and technical tieups	
[5] Vitalisation of industry associations	SLAEA EDB	• Increase of members • Formulation of plan for exchanges with similar overseas organisations	• Invitation of foreign experts • Overseas training	
2. Medium- and long-term programmes				
[1] Stable supply of fabrics and auxiliary materials • Stable supply of imported goods • Promotion of domestic production	MHTI TTSC EDB BOI	• Stable supply of imported goods • Study of domestic production (finishing -> fabrics -> yarns etc.)	• Promotion of domestic production (promotion of foreign investment, fostering of privatised textile factories, etc.)	• Stable supply of fabrics and auxiliary materials and other input goods (import and domestic production)
[2] Training of export marketing and management personnel • Training in trade • Training in business management	EDB NIBM	• Formation of consensus in the Government • Formulation of basic concepts and plan • Deliberations with related domestic and foreign organisations	• Strengthening and augmentation of existing trade and business management training functions • Invitation of foreign experts and overseas training of EDB and NIBM staff	• Establishment of Trade Training Centre (provisional name) or establishment of centre functions • Establishment of Productivity Centre (provisional name) or establishment of centre functions
[3] Upgrading export products	MHTI EDB Moratuwa University	• Strengthening of export promotion activities • Development of export markets	• Strengthening of export promotion activities • Improvement of quality control and productivity	• Introduction of new production equipment and technologies • Design development • Input of new materials
[4] Improvement of infrastructure and prevention of industrial pollution	MIST CISIR	• Formation of consensus in the Government through MIST initiative • Deliberations with related domestic and foreign organisations	• Development of industrial estates • Formulation of implementing plan by invitation of foreign experts etc.	• Improvement of infrastructure • Establishment of Industrial Pollution Prevention Centre (provisional name) or establishment of centre functions

Table-4 Action Programmes for Promotion of Gems and Jewellery Industry

Programme	Implementing organisation	Action/Activity		
		Follow-up	Short-term (1 to 3 years)	Medium and long-term (4 years or more)
1. Short-term programmes				
[1] Assistance in development of products and markets to 20 specific companies (15 jewellery companies and 5 gem companies)	EDB	<ul style="list-style-type: none"> • Preparation of guidance plans • Selection of companies • Invitation of foreign experts 	<ul style="list-style-type: none"> • Diagnosis of companies • Diagnosis of potential possibilities for augmentation of exports • Technical guidance • Marketing guidance • Assistance in participation in trade fairs of key countries 	<ul style="list-style-type: none"> • Assistance in product development • Marketing assistance • Technical development • Augmentation and strengthening of facilities and machinery
[2] Augmentation of technical guidance to individual companies by industry experts	EDB	<ul style="list-style-type: none"> • Selection of companies covered • Invitation of foreign experts • Guidance to individual factories 	<ul style="list-style-type: none"> • Active use of expert dispatch schemes of foreign technical assistance organisations 	
[3] Dispatch of technical trainees overseas	EDB	<ul style="list-style-type: none"> • Selection of trainees dispatched 	<ul style="list-style-type: none"> • Securing places receiving trainees • Active use of public training schemes 	
[4] Assistance in R&D and guidance in product development	EDB SGC	<ul style="list-style-type: none"> • Preparation of plan for development and guidance • Selection of experts • Selection of companies • Preparations for seminars 	<ul style="list-style-type: none"> • Invitation of foreign experts • Overseas training 	
<ul style="list-style-type: none"> • Development of calibrated stones • Technical development of geuda heat treatment • Augmentation and strengthening of precious metal refining and alloying plants 				
[5] Assistance to participation in trade fairs in major countries	EDB	<ul style="list-style-type: none"> • Invitation of foreign experts • Selection of companies and assistance 	<ul style="list-style-type: none"> • Continued participation in trade fairs in the U.S., Europe, and Asia 	<ul style="list-style-type: none"> • Participation in new trade fairs
2. Medium- and long-term programmes				
[1] Augmentation and strengthening of education and training for fostering craftsmen	EDB SGC MHE	<ul style="list-style-type: none"> • Formulation of plan for expansion of development and training of human resources • Deliberations and coordination with related domestic and foreign organisations 	<ul style="list-style-type: none"> • Reorganisation of existing training organisations and augmentation and strengthening of same 	<ul style="list-style-type: none"> • Invitation of foreign experts • Provision of equipment and facilities • Overseas dispatch of trainees • Establishment of new facilities
<ul style="list-style-type: none"> • Augmentation and strengthening of existing training facilities (EDB, SGC, MHE) • Assistance in plans for establishment of new training facilities etc. • Overseas dispatch of trainees 				
[2] Augmentation of exchanges among production areas and industries	EDB	<ul style="list-style-type: none"> • Formulation of exchange programme • Deliberations and coordination with related domestic and foreign organisations 	<ul style="list-style-type: none"> • Establishment and strengthening of opportunities for exchanges 	<ul style="list-style-type: none"> • Mutual dispatch of trade missions • Hosting of business meetings • Participation in trade fairs • Running of marketing activities
[3] Implementation of PR and sales promotion programmes in specific export markets	EDB Overseas Sri Lankan embassies	<ul style="list-style-type: none"> • Strengthening of export promotion activities • Development of export markets 	<ul style="list-style-type: none"> • Augmentation of opportunities for PR • Strengthening of marketing activities 	<ul style="list-style-type: none"> • Augmented implementation of PR activities • Sponsoring of events (general Sri Lanka fairs) • Dispatch of trade missions

Table-5 Action Programmes for Promotion of Rubber-Based Product Industry

Programme	Implementing organisation	Action/Activity		
		Follow-up	Short-term (1 to 3 years)	Medium and long-term (4 years or more)
1. Short-term programmes				
[1] Guidance in factory control • Guidance on factory floors (factory control, quality control, testing and inspection, etc.) • Seminars	EDB IDB	• Selection of companies and preparation of guidance plans • Selection of experts • Preparations for seminars	• Invitation of short-term foreign experts (continued for at least three years)	
[2] Guidance to managers • Seminars • Guidance in companies • Overseas training	IDB EDB	• Deliberations with related domestic and foreign organisations • Deliberations with companies (selection of experts etc.) • Preparations for seminars • Selection of companies for training • Preparation of plan for training	• Invitation of short-term foreign experts • Overseas training	
[3] Guidance in development of suitable export products • Testing of marketability of products • Guidance in improvement of products (guidance at factories) • Provision of overseas market information and technical information	EDB	• Deliberations with related domestic and foreign organisations • Deliberations with companies (selection of experts, determination of companies, preparations for tests)	• Invitation of short-term foreign experts (continued for at least three years)	
[4] Implementation of overseas market surveys	EDB	• Deliberations with related domestic and foreign organisations (selection of markets, products, etc.)	• Overseas market surveys • Hosting of meeting for survey report	
[5] Implementation of export promotion activities • Participation in overseas exhibitions • Dispatch of missions • Hosting of business meetings	EDB	• Deliberations with related domestic and foreign organisations (selection of participating companies, determination of schedule, PR, etc.)	• Dispatch of missions	
[6] Short-term overseas training (exposure visits) of staff in promotion organisations • Surveys of overseas market trends and technical trends	EDB	• Deliberations with related domestic and foreign organisations (selection of trainees, determination of training content and schedule)	• Short-term overseas training • Hosting of meeting for reports	
2. Medium- and long-term programmes				
[1] Establishment of standards, strengthening of testing and inspection organisations, establishment of export inspection system	SLSI	• Requests for cooperation	• Invitation of foreign experts • Development surveys	• Provision of equipments • Overseas training
[2] Guidance and assistance to small holders	RRI		• Implemented by World Bank	
[3] Fostering of manpower for export marketing	EDB	• Formulation of basic concepts	• Development surveys	• Invitation of foreign experts
[4] [a] Improvement of infrastructure	MIST etc.		[a] Construction of industrial estates	[a] Improvement of roads, ports, communications, etc.
[b] Environmental protection	CISIR	[b] Requests for cooperation	[b] Invitation of foreign experts	[b] Provision of equipment, [c] Overseas training
[5] Strengthening and augmentation of common service facility for R&D and training	EDB MIST	• Raising issues at Rubber Advisory Committee of EDB	• Strengthening of ties and coordination among RRI, IDB, CISIR, MIST, and EDB	• Development surveys

Table-6 Action Programmes for Promotion of Exports (1/3)

Programme	Implementing organisation	Action/Activity		
		Follow-up	Short-term (1 to 3 years)	Medium and long-term (4 years or more)
I. Short-term programmes				
1. Comprehensive and sustained programme covering garments and apparel, gems and jewellery, and rubber-based products				
[1] Formulation of package of EDB programmes for promotion of promising companies		• Deliberations with related domestic and foreign organisations	• Invitation of short-term foreign experts (continued for at least three years)	
• Surveys of industries and companies (pinpointing of issues)		• Deliberations with industries and companies (selection of experts and decision on survey plans)		
• Selection of companies for promotion				
• Diagnosis of companies and preparation of guidance plans				
[2] Guidance in matters of production (factory control, production technology, testing and inspection, pollution prevention, etc.)	EDB (IDB)	• Deliberations with related domestic and foreign organisations	• Invitation of short-term foreign experts (continued for at least three years) (corporate guidance and seminars)	• Invitation of foreign experts on private basis
• Guidance to companies covered on production floors		• Deliberations with companies (preparations for guidance, determination of schedule)		
• Hosting of seminars		• Preparations for hosting of seminars		
• Guidance in development of suitable export products				
[3] Guidance in matters of management (management modernisation, quality control, etc.)	EDB Industry associations	• Deliberations with related domestic and foreign organisations	• Invitation of short-term foreign experts (continued for at least three years)	
• Hosting of seminars		• Deliberations with companies and industry associations (selection of companies trained, seminar contents, etc.)	• Dispatch of entrepreneurs overseas	
• Overseas training (exposure visits)		• Preparations for seminars		
• Promotion of industry associations				
[4] Strengthening of marketing	EDB Overseas Sri Lankan embassies	• Deliberations with related domestic and foreign organisations	• Invitation of short-term foreign experts (continued for at least three years) (corporate guidance and seminars)	• Invitation of foreign experts on private basis
• Collection and dissemination of overseas market information		• Deliberations with companies (determination of products covered, themes of guidance, and schedule, selection of companies participating in missions etc., preparations for catalogs and DM)	• Dispatch of missions	
• Improvement of products for Japanese and target markets (monitoring, product adaptation)		• Preparations for seminars	• Participation in overseas exhibitions	
• Hosting of seminars on Japanese and target markets			• Hosting of business meetings (EXPO and individual)	
• Dispatch of missions (exhibitions, business meetings, market surveys)				
• Reception of missions and hosting of buyers/sellers meetings				
2. Programmes for promotion of exports of other industries	EDB	• Deliberations with related domestic and foreign organisations	• Invitation of short-term foreign experts (corporate guidance and seminars)	
[1] Surveys for selection of industries and companies to be guided		• Deliberations with industries and companies (determination of products and companies, preparation of survey plans, determination of experts, etc.)	• Overseas market research	
[2] Formulation of comprehensive, sustained programmes			• Overseas training	
[3] Implementation of overseas market surveys				
[4] Collection and dissemination of overseas market information				

Table-6 Action Programmes for Promotion of Exports (2/3)

Programme	Implementing organisation	Action/Activity		
		Follow-up	Short-term (1 to 3 years)	Medium and long-term (4 years or more)
<p>3. Strengthening of functions and activities of EDB</p> <p>[1] Strengthening of assistance to export companies</p> <ul style="list-style-type: none"> • Strengthening of trade consultations, procedural improvements, and exports from regional districts 	EDB	<ul style="list-style-type: none"> • Deliberations with related domestic and foreign organisations (determination of plans for strengthening and schedules, selection of experts, provision of materials and data, determination of overseas trainees) • Preparations for EDB workshops and in-house training 	<ul style="list-style-type: none"> • Invitation of short-term foreign experts (surveys, workshops, in-house training) • Overseas training of EDB staff 	<ul style="list-style-type: none"> • Invitation of foreign experts on long term basis • Provision of information and data to local offices
<ul style="list-style-type: none"> • Strengthening of information services (library, publications, PR, CTIS) 	EDB Overseas Sri Lankan embassies	<ul style="list-style-type: none"> • Deliberations with related domestic and foreign organisations (determination of plans for strengthening and schedules, selection of experts, provision of materials and data, determination of overseas trainees) • Collection and strengthening of overseas market information 	<ul style="list-style-type: none"> • Invitation of short-term foreign experts (surveys, workshops, in-house training) • Overseas training of EDB staff 	
<ul style="list-style-type: none"> • Improvement of exhibition techniques (World Trade Centre, EXPO, etc.) 	EDB	<ul style="list-style-type: none"> • Deliberations with related domestic and foreign organisations (determination of plans and schedules, selection of experts) • Preparations for workshops and in-house training 	<ul style="list-style-type: none"> • Invitation of short-term foreign experts (surveys, workshops, in-house training) • Overseas training of EDB staff 	
[2] Enhancement of abilities of EDB staff	EDB	<ul style="list-style-type: none"> • Deliberations with related domestic and foreign organisations (selection of products and persons covered, determination of training themes and schedules) 	<ul style="list-style-type: none"> • Overseas training of EDB staff 	
<p>4. Strengthening of PR and promotion of Sri Lankan products overseas</p> <ul style="list-style-type: none"> • Augmentation of Export Promotion Window (EPW) • Implementation of in-store promotion • Improvement of image of Sri Lanka 	EDB Overseas Sri Lankan embassies	<ul style="list-style-type: none"> • Deliberations with related domestic and foreign organisations (preparation of long-term, comprehensive PR and promotion plans, selection of EPW exhibited products by experts, etc.) 	<ul style="list-style-type: none"> • Use of PR companies • Invitation of journalists to Sri Lanka • Preparation of promotional materials 	<ul style="list-style-type: none"> • Establishment of SAARC Trade, Investment, and Tourism Promotion Centre

Table-6 Action Programmes for Promotion of Exports (3/3)

Programme	Implementing organisation	Action/Activity		
		Follow-up	Short-term (1 to 3 years)	Medium and long-term (4 years or more)
II. Medium- and long-term programmes				
1. Establishment of standards, promotion of standardisation, and strengthening of TQM in companies	SLSI	• Requests for cooperation	• Invitation of foreign experts • Development surveys	• Provision of equipment • Overseas training
2. Fostering of manpower for export marketing	EDB	• Formulation of basic concepts	• Development surveys	
3. Strengthening and augmentation of central common service facility for R&D, testing and inspection, and training	MIST	• Deliberations with related domestic and foreign organisations (formulation of current problems, needs, priorities, and basic concepts)	• Development surveys	
4. Fostering of managers and improvement of productivity	NIBM	• Requests for cooperation	• Invitation of foreign experts • Development surveys	• Provision of equipment • Overseas training
5. Invitation of experts on private and long-term basis	EDB	• PR on current programmes	• Matching of interested companies and experts	• Invitation of foreign experts
6. Augmentation of financial system for expansion and modernization of facilities	EDB	• Surveys of current systems	• Survey of needs	
7. Study on concept of SAARC Trade, Investment, and Tourism Promotion Centre	MIST BOI EDB Overseas Sri Lankan embassies	• Survey of ASEAN Centre	• Deliberations in SAARC	• Recommendations of basic concepts
8. Improvement of infrastructure	MIST etc.		• Construction of industrial estates	• Augmentation of roads, communications, ports, etc.
9. Fostering of supporting industries	IDB MIST EDB	• Recommendations of development survey	• Development surveys and formulation of promotion measures	

Table-7 Action Programmes for Promotion of Investment (1/2)

Programme	Implementing organisation	Action/Activity		
		Follow-up	Short-term (1 to 3 years)	Medium and long-term (4 years or more)
I. Short-term programme				
1. Improvement of investment incentives and policies	BOI/MIST Industrialisation Commission	<ul style="list-style-type: none"> • Review of current incentives and policies and grasp of issues • Deliberations with related domestic and foreign organisations 	<ul style="list-style-type: none"> • Maintenance of current systems and policies • Improvement of investment approval and incentives • Promotion of streamlining and acceleration of procedures (including customs clearance) 	
2. Strengthening of foreign investment promotion activities of BOI	BOI Overseas Sri Lankan embassies UNIDO Investment promotion organisations of other countries	<ul style="list-style-type: none"> • Formulation of plans for activities for promotion of foreign investment and strengthening of promotional activities • Establishment of panel for promotion of dialogues with existing foreign companies 	<ul style="list-style-type: none"> • Invitation of journalists • Dispatch and acceptance of missions • Hosting of seminars • Active use of schemes of UNIDO and related organisations of other countries • Uncovering of potential investors • Direct approaches • Matching service (introductions for joint ventures, technical tieups, etc.) 	
3. Invitation of foreign advisors on investment promotion	BOI	<ul style="list-style-type: none"> • Formulation of plans for invitations • Establishment of panel for promotion of dialogues with existing foreign companies 	<ul style="list-style-type: none"> • Promotion of dialogues with existing foreign companies • Promotional activities aimed at potential investors • Investment consultations and response to inquiries 	
4. Improvement of information materials • Strengthening of PR and publicity on Sri Lanka and its investment environment	BOI	<ul style="list-style-type: none"> • Strengthening of activities for promotion of foreign investment 	<ul style="list-style-type: none"> • Improvement and distribution of pamphlets and investment guides for promoting foreign investment • Improvement and distribution of videos for promotion of investment 	
5. Promotion of dialogues with foreign companies in Sri Lanka	BOI Investment promotion advisors Key investing countries' related organisations	<ul style="list-style-type: none"> • Establishment of panel for promotion of dialogues with existing foreign companies 	<ul style="list-style-type: none"> • Grasp of problems, requests for improvement, etc. • Formulation and implementation of feasible actions 	
II. Medium- and long-term programme				
1. Improvement of infrastructure	BOI/MIST Industrialisation Commission Related organisations	<ul style="list-style-type: none"> • Formation of consensus in the Government through MIST initiative • Deliberations with related domestic and foreign organisations 	<ul style="list-style-type: none"> • Construction of industrial estates • Formulation of plans for implementation through invitations of foreign experts 	<ul style="list-style-type: none"> • Stable supply of electric power • Improvement of transportation (roads, shipping, and air freight) • Improvement of communications • Development of industrial estates

Table-7 Action Programmes for Promotion of Investment (2/2)

Programme	Implementing Organisation	Action/Activity		
		Follow-up	Short-term (1 to 3 years)	Medium- and long-term (4 years or more)
2. Expansion of BOI	BOI	<ul style="list-style-type: none"> • Formulation of plans for expansion of BOI 	<ul style="list-style-type: none"> • Implementation of plans for expansion of BOI 	<ul style="list-style-type: none"> • Strengthening of organisation of BOI
3. Study on SAARC Trade, Investment and Tourism Promotion Centre concept	BOI/MIST Ministry of Foreign Affairs	<ul style="list-style-type: none"> • Deliberations with related domestic and foreign organisations 	<ul style="list-style-type: none"> • Deliberations with countries related to SAARC Centre 	<ul style="list-style-type: none"> • Promotion of idea of establishment of SAARC Centre
4. Enhancement of PR and investment promotion activities in key target countries	BOI	<ul style="list-style-type: none"> • Enhancement and strengthening of activities for promotion of investment • Formulation of plans for selection of target companies 	<ul style="list-style-type: none"> • Enhancement and strengthening of investment promotion activities • Advance surveys for selection of target companies 	<ul style="list-style-type: none"> • Establishment of key industries for promotion of investment and running of PR and investment promotion campaigns for these key industries • Selection of target companies and company visits • Invitation of journalists (trips to cover articles)

Table-8 Metalworking Industry Promotion Plan

Item	Short-term	Medium and Long-term
1. Revitalization of public enterprises (high levels of equipment and manpower, and low capacity utilization)	Financial assistance, feasibility of import substitution and exports	Considering privatization
2. Revitalization of privatized public enterprises (high levels of equipment and manpower, and low capacity utilization)	Finding subcontractors, serving domestic demand	Export expansion
3. Fostering of private enterprises	Quality improvement, rationalization of production system, and import substitution	Development of export-oriented organisation, and export expansion
1) Government policy		
2) Improvement of production technology		
a) Training facilities and equipment Cutting, welding, sheet metal processing (existing facilities and equipment available)	Adjustment of training program	Continue
Casting, plating, waste water treatment (insufficient)	New installation, renovation, operation	Operation
Forging, heat treatment, mould (market undefined)		
b) On-site instruction (highly required)	Consultation by experts	Continue
c) Overseas training (highly required)	Training overseas	Continue
d) BOI corporateties-up	Study on possibility	Promotion of tie-up
3) Expansion of domestic market (to replace imports)	Study on imported goods and Gov. procurement	Implementation
4) Promotion of subcontracting work (undeveloped)		
5) Export market for metalwork products other than machinery parts	Study of specific good's import	Promotion of export
6) Promotion of foreign investment (high demand)	Identify specific enterprises and commodities	To find foreign partner
7) Industrial estate for metal-working industry (demand exists)	Study on possibility by negotiating with enterprises	Promotion of relocation
8) Financial demand/supply (for modernization and capacity expansion)	Study on required amount	To apply sector loan
9) Promotion of technical cooperation among developing countries	Study on possibility	Promotion of cooperation

Table-9 Action Programmes for Consolidation of
Metalworking Industry (1/3)

Programme	Action/Activity
1. Establishing Firm Policy to Promote the Metalworking Industry	<p>The metalworking industry serves as a foundation for manufacturing industries. Certain sub-sectors of the metalworking industry are particularly suitable for local needs and conditions. The fostering of these sub-sectors will lead to import substitution and export promotion, resulting in improvement of the country's balance of payments and an increase in employment of male workers. Based on this understanding, it is proposed that (1) the Sri Lankan Government will designate the metalworking industry as a strategic industry with high priority for Government assistance, (2) an organisation specialized in promotion of the metalworking industry will be established within the Ministry of Industry, (3) private metalworking enterprises will be organized for concerted activities, and (4) appropriate promotional measures (including various action plans) will be devised and implemented. It is also effective to invite experts from a country(ies) which has successfully implemented similar promotional measures.</p>
2. Promoting Modernization of Privatized Enterprises	<p>As privatized metalworking enterprises have relatively large production capacities and a large number of competent engineers, they would greatly benefit from modernization investment. Their modernization plans should preferably be developed with participation from foreign experts. Foreign partners can be found relatively easy in this way.</p>
3. Upgrading Metalworking Technology	<p>Existing metalworking training centres do not have sufficient training facilities or courses on foundry and plating processes. Private foundries have a great interest in investment, but they lack competitiveness due to very low levels of production technology. As a result, Sri Lanka has to import foundry products in large quantities. Thus it is important to establish training facilities and courses on foundry processes and plating techniques.</p>

Table-9 Action Programmes for Consolidation of
Metalworking Industry (2/3)

Programme	Action/Activity
4. Development of Domestic Market	<p>It is recommended to evaluate types of training equipment for the foundry process and plating center as suggested in Appendix IV, Volume III. In the implementation of the metalworking training center, the role of MIST for the consolidation of metalworking industry should be recognized, and MIST should take initiative in coordination with the existing training centers of other ministries.</p> <p>Development of the domestic market should start from a market study. Sri Lanka imports a variety of metalwork products other than assembled machinery, such as automobiles and household appliances. It is recommended to study and identify the present situation of and major reasons for these imports and procurement plans of the Government authorities and organizations, and to study opportunities for import substitution.</p>
5. Promotion of Subcontracting	<p>In Sri Lanka, the subcontracting system has not been developed preventing technical improvement and creating diseconomies for both industries and the nation as a whole, i.e., duplication in investment and low capacity utilization rate. Since many enterprises are interested in subcontracting, it is recommended to establish an organisation serving as an exchange centre between potential customers and subcontractors.</p>
6. Exploration of Export Markets	<p>It is recommended to select metalwork products (other than machinery) suitable for local production, and to study selected countries and areas that have potential as export markets.</p>

Table-9 Action Programmes for Consolidation of
Metalworking Industry (3/3)

Programme	Action/Activity
7. Capital Requirement Survey	As part of promotional measures for the metalworking industry, a sector loan may be used to provide funds under favorable conditions. In this regard, an accurate estimate of capital requirements should be made.
8. Promotion of Cooperation with Foreign Corporations	Partnership with foreign corporations is an effective way of promoting industrial modernization, and many metalworking enterprises have expressed high interest. To ensure a beneficial partnership, potential partners in Sri Lanka should be listed and identified by their products as well as the nature and scope of cooperation, so as to facilitate pairing with suitable foreign partners. For this purpose, a demand survey should be carried out throughout the country.
9. Development of Industrial Park for Metalworking Enterprises	Relocation of plating shops and foundries to an industrial park equipped with adequate facilities is expected to be economically beneficial, because (1) they are becoming an increasing threat to the surrounding residential environment, (2) one electrical furnace for common use will be sufficient to supply castings to meet demand in the small domestic market, and (3) induced concentration will allow these companies to collectively purchase equipment that would otherwise be a heavy financial burden on an individual company. The first step, is to present a conceptual plan for a model industrial estate to the related parties, and if a sufficient number of enterprises show interest, it should be upgraded to a formal plan.
10. Promotion of Technological Exchange with Other Developing Countries	Several research institutes in Sri Lanka are developing technologies applicable to local products, some of which seem to be adaptable to Southeast and Southwest Asian countries. As technological exchange with these countries offers an opportunity for upgrading of technology at large, it is recommended to develop technological exchange programs in consultation with the organizations.

Table-10 Technical Problems of Foundry and Improvement Measures (1/3)

PRODUCTION MEASURES	PROBLEMS	IMPROVEMENT MEASURES
PATTERN MAKING	<ol style="list-style-type: none"> (1) Poor workmanship. (Incorrect casting thickness and dimensions, mold & core mismatch, poor cast surface, and inclusion, etc.) (2) Lack of pattern draft. (Mold breakage, incorrect shape of remade part, and sand inclusion) (3) Fillet radius is small and uneven by manual molding. (4) Core box is finished with poor workmanship. Sand flash causes rough surface. (5) Sand sticking to pattern. (6) Wooden patterns are not inspected. (Delaying detection of defect in dimension and shape) 	<ul style="list-style-type: none"> * Improving ability to understand drawings accurately. * Learning pattern design techniques. * Standardization of pattern making. (pattern draft, core print, machining allowance, etc.) * Use of contraction rule. * Improvement of core box making techniques. * Painting of wooden patterns. * Teaching of wooden patterns inspection.
(CAST IRON) MELTING	<ol style="list-style-type: none"> (1) Character of material is not controlled. (Insufficient material strength, unmachinable coarse grain on machined surface) (Failure to manufacture castings according to customer requirements. Grey iron, Alloyed cast iron, Ductile cast iron, etc.) (2) Tapping temperature of cupola is low. Tapping temperature is not measured. (Casting defects such as cold shut, misrun, porosity, blowholes) (3) Foundry coke needs to be imported and is costly. (4) Foundry pig iron is difficult to import, as a bulk of 1,000 tons is too big. (5) Refractory material for cupola is unknown. (Both imported and locally made ones) 	<ul style="list-style-type: none"> * Learning of correct cupola operation. * Establishment of in-plant test before pouring. (Chill control, CE meter) * Teaching inoculation of cast iron. * Improvement of cupola. * Introduction of induction melting furnace. * Introduction of temperature measuring instruments. * Quality control of raw materials for melting. * Analysis of raw materials. * Collective imports of pig iron, coke and other materials through FDSI. * Appropriate use of refractory materials. * Standardization of melting operation.
(NON-FERROUS METAL)	<ol style="list-style-type: none"> (6) Non-ferrous castings are made from unknown scraps, not according to standards. (7) Neither anti-oxidization nor degassing of molten metal is performed. (Casting defects such as inclusion of oxidized film and pinholes) (8) No modification is made for Al-Si alloy. (Poor strength not conforming to standards) (9) Cast iron pot for Al melting does not have lining. (Contamination of iron decreases strength and shortens the life of the pot) 	<ul style="list-style-type: none"> * Imports of non-ferrous ingots and mother alloys. * Analysis of chemical imposition. * Standardization of melting operation. * Use of flux. * Implementation of modification and imports of modifying agent. * Lining of cast iron pot.

Table-10 Technical Problems of Foundry and Improvement Measures (2/3)

PRODUCTION MEASURES	PROBLEMS	IMPROVEMENT MEASURES
SAND PREPARATION	<ol style="list-style-type: none"> (1) Poor quality of green sand. (Frequent casting defects due to poor mixing of sand or repeated use, such as sand inclusion, blowhole, pinhole, scabs, penetration.) (2) Insufficient strength of core sand, insufficient gas vent. (Inefficient handling, damage, casting defect) (3) Poor mold wash (Poor cast furnace, sand penetration) (4) Floor molding, wooden flask, insufficient mold weight. (Poor productivity; casting defects such as poor dimensional accuracy, mold & core mismatch, leakage of molten metal) (5) Key techniques such as gating and feeder heads rely on molders, failing to produce castings with stable quality. 	<ul style="list-style-type: none"> * Learning of green sand quality control techniques. * Use of synthetic molding sand. * Use of mixer. * Use of sand reclaiming and reconditioning equipment. * Teaching of oil sand, CO₂ process, organic self-hardening sand. * Teaching of gas ventilation method. * Teaching of mold wash material and method. * Use of metal flask and guide pin. * Use of clamp and mold weight to prevent cope lifting. * Learning of casting plan.
SAND REMOVAL/ FINISHING	<ol style="list-style-type: none"> (1) Shot blasting is rarely used. (Causing rough cast surface, sticking of sand) (2) Finishing by pedestal grinder. (Inefficient) (3) Very poor finishing of inner surface of castings. (4) Annealing furnace is rarely used. Some want softening anneal. 	<ul style="list-style-type: none"> * Use of strong shot blasting. * Use of swing type or angle grinder. * Preparation of sand removing tools. * Installation of annealing furnace.
TESTING/ INSPECTION	<ol style="list-style-type: none"> (1) Shortage of testing and inspection equipment and tools. (Lack of quality assurance affects the subsequent process, leading to poor reputation of the foundry industry.) (2) No quality standard is established for user or maker. (3) Quality control data are not available. 	<ul style="list-style-type: none"> * Gaining of knowledge and skills on testing/inspection and quality assurance. * Improvement of testing and inspection facilities. * Utilization of private and public testing organizations. * Exchange of specifications between makers and users. * Establishment and use of industrial standards. * Storage and use of quality record.
EQUIPMENT MAINTENANCE	<ol style="list-style-type: none"> (1) Equipment is poorly maintained. (Largely due to rain leaking through the roof.) (2) Spare parts are not available. (3) The concept of depreciation for equipment purchase is not well understood. (12.5% on tax law) (4) Equipment maintenance budget is not included in production cost. 	<ul style="list-style-type: none"> * Implementation of periodic maintenance and repair. * Improvement of maintenance standards. * Documentation of consumables and wearing parts, and local production. * Scheduled equipment renewal. * Preventative repair.

Table-10 Technical Problems of Foundry and Improvement Measures (3/3)

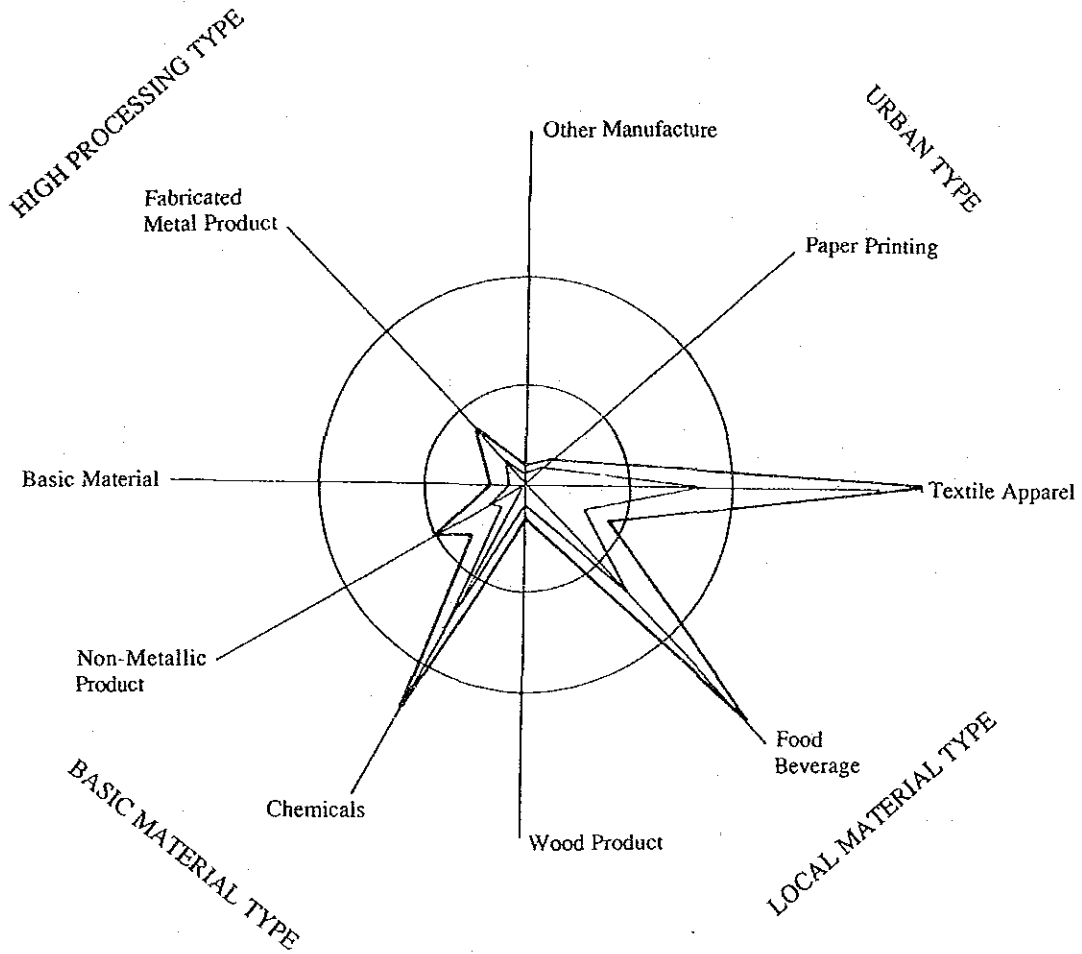
PRODUCTION MEASURES	PROBLEMS	IMPROVEMENT MEASURES
PRODUCTION CONTROL	<ol style="list-style-type: none"> (1) Difficult to keep delivery schedule. (Loss of customer's confidence, and difficult to achieve profit targets) (2) Insufficient control of production cost. (Appropriate price unknown, lack of cost reduction effort) (3) Excess inventory. (Undue financial burden) (4) Materials are not available on demand. (Delay in delivery schedule, unfavorable purchase condition) 	<ul style="list-style-type: none"> * Establishment of order processing system. * Learning of process control technology. (Piling/leveling of work load) * Reduction of defective casting. * Method of establishing standard cost and learning of differential analysis method * Reduction of inventory through collective purchase by FDSI. * Learning of appropriate inventory planning techniques. * Use of FDSI inventory information.

Table-11 Facility Plan for Industrial Estates

Facility	Atherfield	Martin	Sirigampola	Ekala	Katana
1. Road	Access road from National Highway A4: 600 m (in Industrial Estate) Arterial road: 3,210 m Collector road: 3,450 m	No access road because of direct connection to National Highway A3 (in Industrial Estate) Arterial road: 4,500 m Collector road: 940 m	Access road from National Highway A3: 4,500 m (in Industrial Estate) Arterial road: 1,000 m Collector road: 2,500 m	No access road because of direct connection to National Highway A33 (in Industrial Estate) Arterial road: 5,650 m Collector road: 1,750 m	No access road because of direct connection to regional road (in Industrial Estate) Arterial road: 1,450 m Collector road: 1,600 m
2. Water supply	Intake facility : from Kelani River Purification plant Distribution pipe: 7,300 m Daily Maximum Water Supply: 11,200 m ³	Intake at 5 km upstream along Deduru River Conveyance pipeline: 15 km Purification plant Distribution pipe: 6,100 m Daily Maximum Water Supply: 16,400 m ³	Existing intake facility from Maha River Conveyance pipeline: 15 km Purification plant Distribution pipe: 3,700 m Daily Maximum Water Supply: 2,200 m ³	Source: Groundwater Purification plant Distribution pipe: 8,470 m Daily Maximum Water Supply: 6,800 m ³	Existing intake facility from Maha River Conveyance pipeline: 10 km Purification plant Distribution pipe: 3,000 m Daily Maximum Water Supply: 2,500 m ³
3. Sewerage	Advanced Sewage Treatment Plant Inflow water quality: BOD 305 ppm SS 620 ppm Treated water quality: BOD 30 ppm SS 30 ppm Treating method: Oxidation ditch Outflow of Kelani River Sewage pipeline network: total 6,000 m	Advanced Sewage Treatment Plant Inflow water quality: BOD 510 ppm SS 716 ppm Treated water quality: BOD 30 ppm SS 30 ppm Treating method: Oxidation ditch Outflow of Deduru River Sewage pipeline network: total 6,900 m	Advanced Sewage Treatment Plant Inflow water quality: BOD 57 ppm SS 147 ppm Treated water quality: BOD 30 ppm SS 30 ppm Treating method: Oxidation ditch Outflow of Gin River Sewage pipeline network: total 4,000 m	Advanced Sewage Treatment Plant Inflow water quality: BOD 58 ppm SS 189 ppm Treated water quality: BOD 30 ppm SS 30 ppm Treating method: Oxidation ditch Outflow of Dandngam River Sewage pipeline network: total 8,800 m	Advanced Sewage Treatment Plant Inflow water quality: BOD 58 ppm SS 388 ppm Treated water quality: BOD 13 ppm SS 30 ppm Treating method: Oxidation ditch Outflow of Kimblapitiya River Sewage pipeline network: total 2,600 m
4. Drainage	U-drain: 14,800 m Outflow to Kelani River	Reinforced concrete pipe: 7,200 m Outflow to Deduru River	U-drain: 1,500 m Reinforced concrete pipe: 2,500 m Outflow to Gin River	U-drain: 500 m Reinforced concrete pipe: 3,700 m Outflow to retention pond in Industrial Estate for flood control	U-drain: 5,800 m Outflow to retention pond in Industrial Estate for flood control
5. Power supply	33 kV transmission line, from Avissawella sub-station: 11 km length Switching station Power line: 4,100 m	33 kV transmission line, from new Chilaw sub-station (in constructing, operation start in 1994): 21 km length Switching station Power line: 6,800 m	Connected to new transmission line (Chilaw to Bolawatta) Switching station Power line: 5,200 m	33 kV transmission line, from Kotugoda sub-station: 1.5 km length Switching station Power line: 6,800 m	12 kV transmission line, from Kotugoda sub-station Switching station Power line: 2,700 m
6. Telecom-munication	Connection by optical fiber cable between Avissawella exchange and compact switchboard in industrial estate	Connection between exchange in Chilaw and switchboard in industrial estate	Connection between Negombo exchange and compact switchboard in industrial estate Necessity of expansion of Negombo exchange	Connection between Gampaha exchange and compact switchboard in industrial estate	Connection between Negombo exchange and compact switchboard in industrial estate Necessity of expansion of Negombo exchange

FIGURES

INDUSTRIAL STRUCTURE IN SRI LANKA



Remark: Data of 1987 (inside) and 1991 (outside)

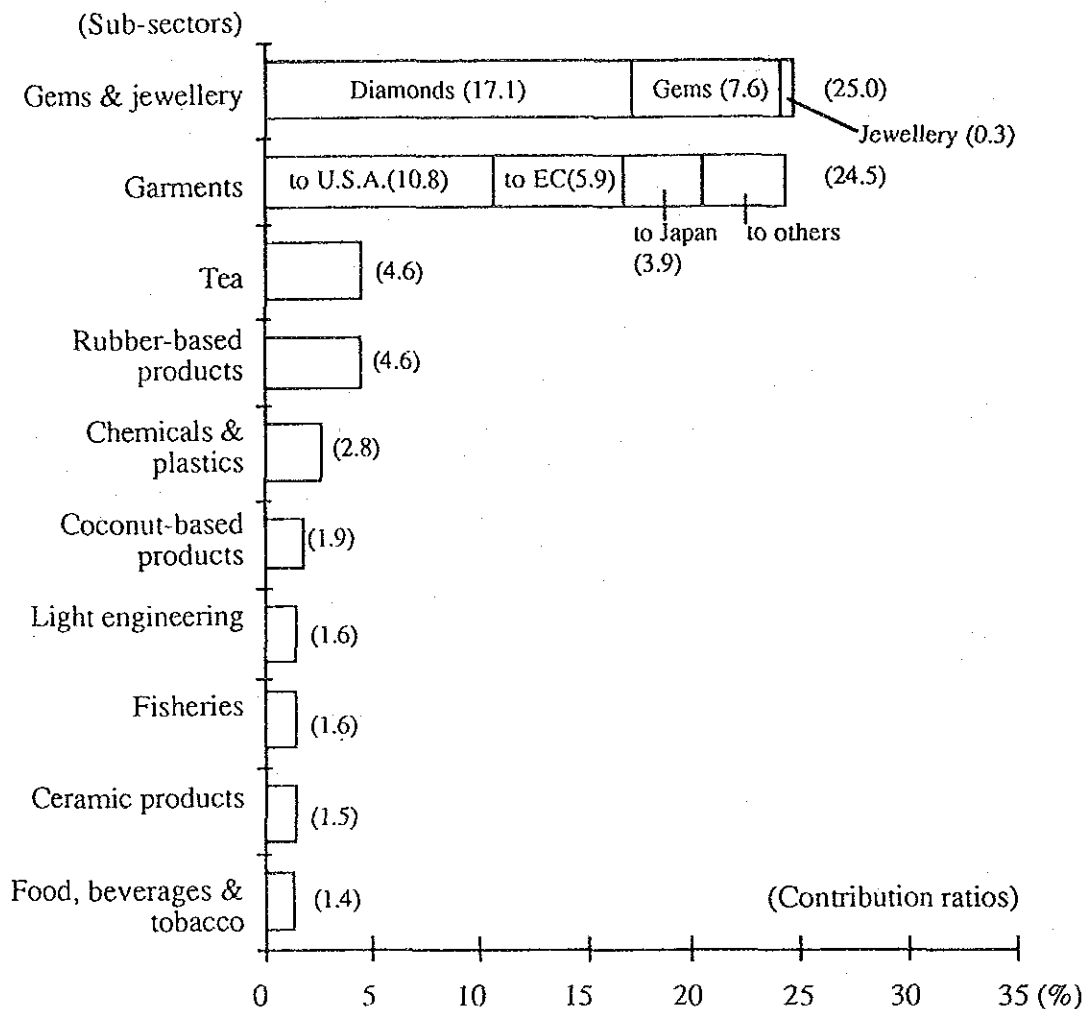
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THE STUDY ON INDUSTRIAL SECTOR DEVELOPMENT IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

Figure-1

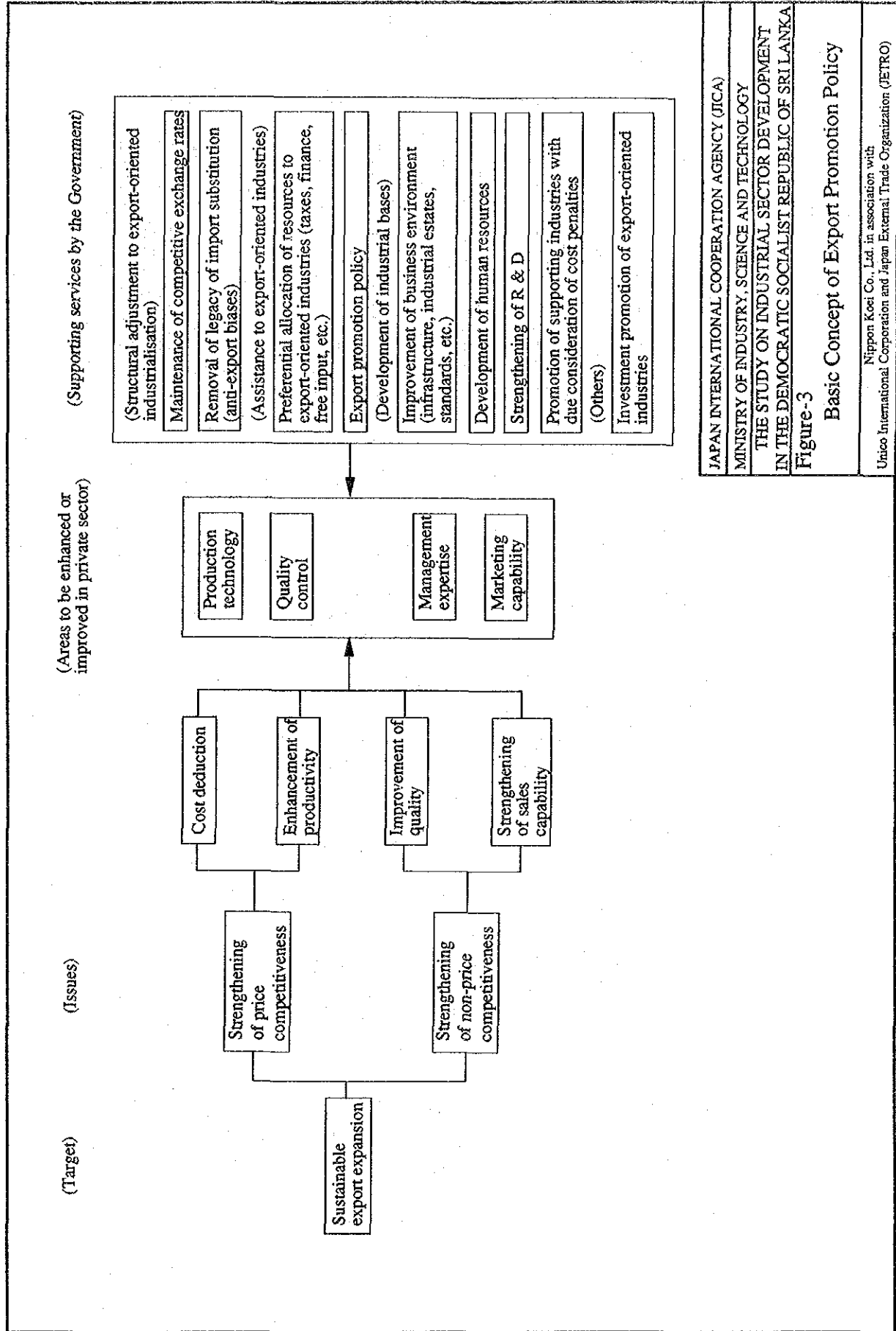
Industrial Structure in Sri Lanka

Nippon Koei Co., Ltd. in association with Unico International Corporation and Japan External Trade Organization (JETRO)
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Contribution Ratios by Major Sub-sectors to the Projected Growth of Total Exports in the Second National Export Development Plan 1990-1994



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Figure-2
Contribution in National Export Development Plan
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 Unico International Corporation and Japan External Trade Organization (JETRO)



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MINISTRY OF INDUSTRY, SCIENCE AND TECHNOLOGY

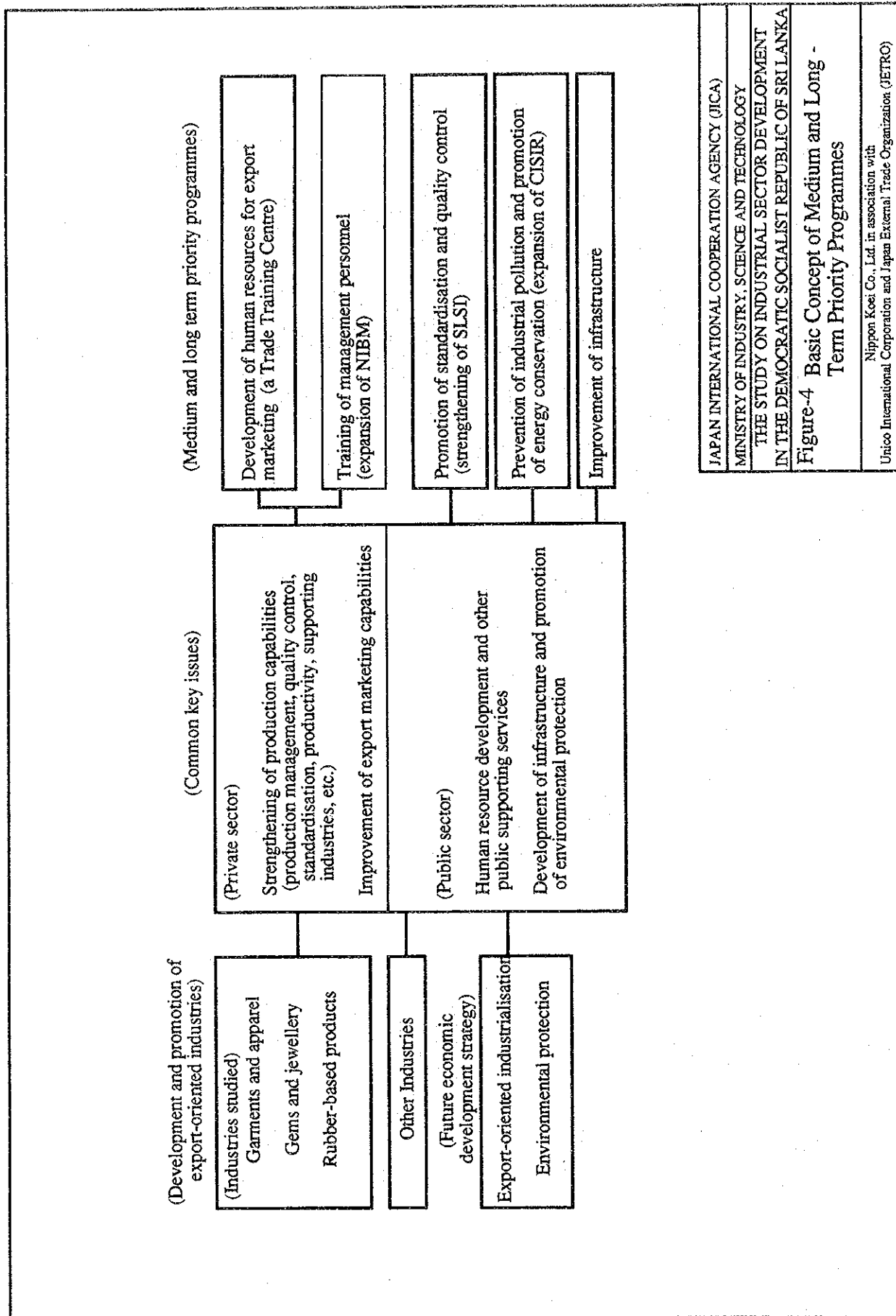
THE STUDY ON INDUSTRIAL SECTOR DEVELOPMENT
IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

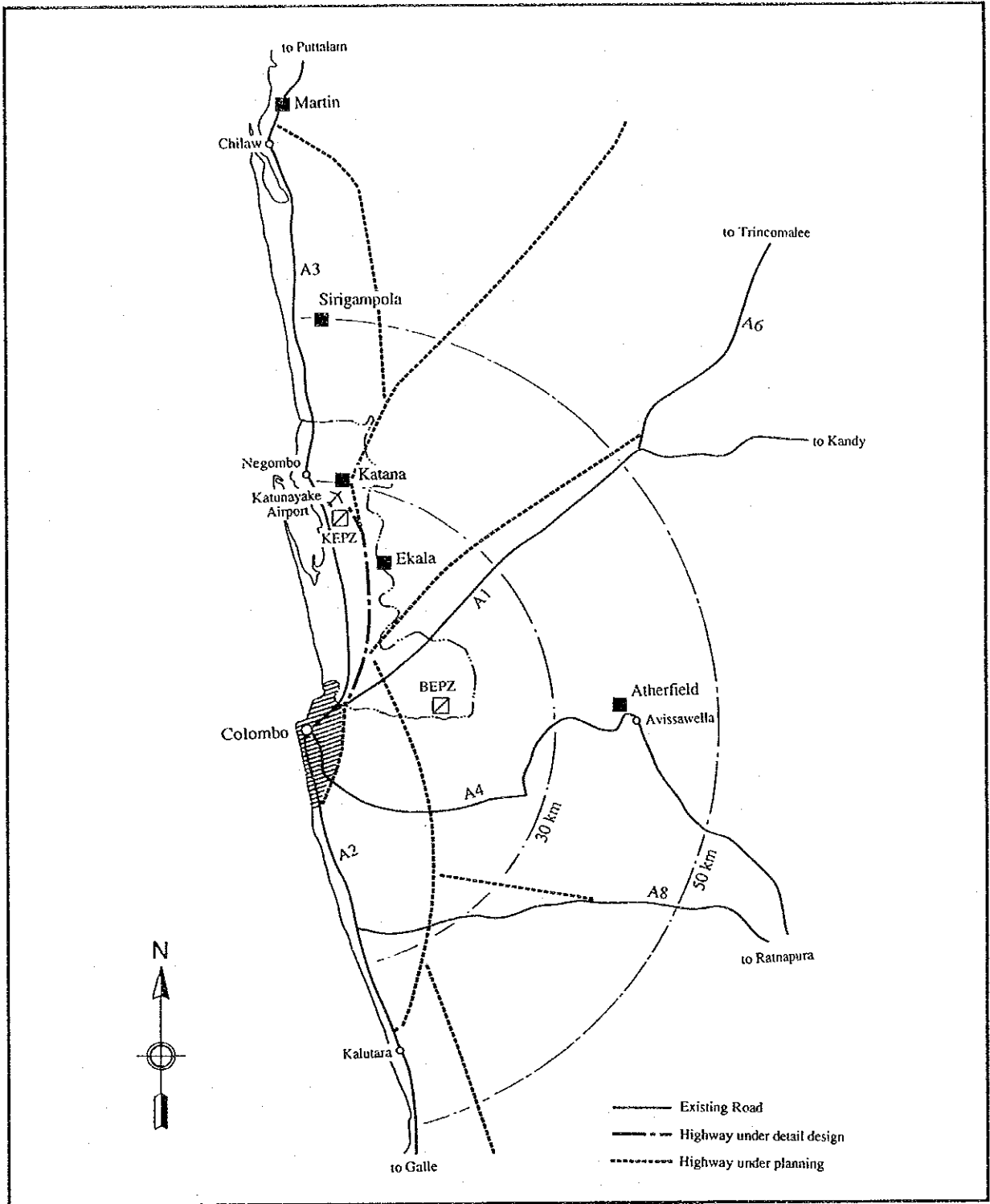
Figure-3

Basic Concept of Export Promotion Policy

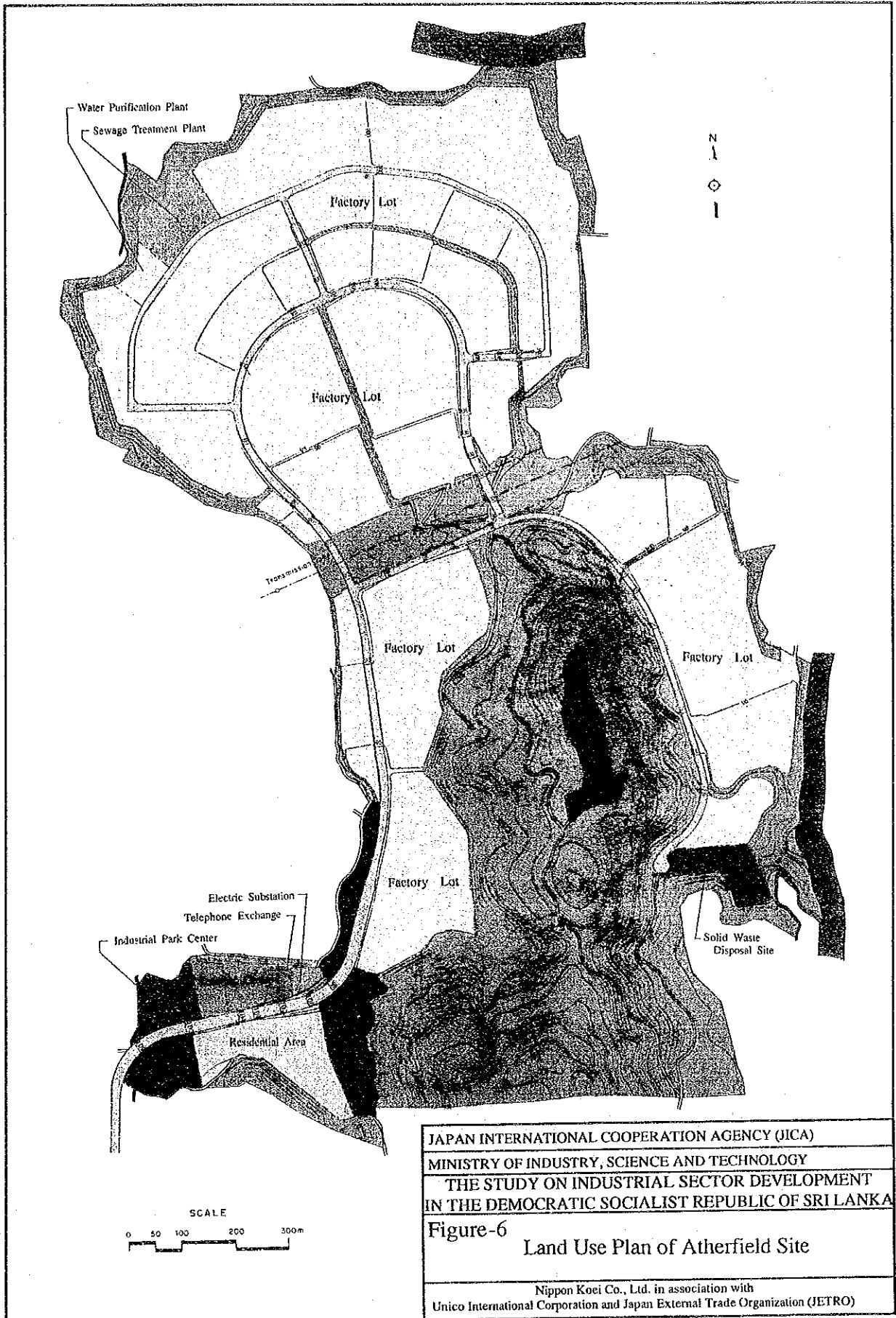
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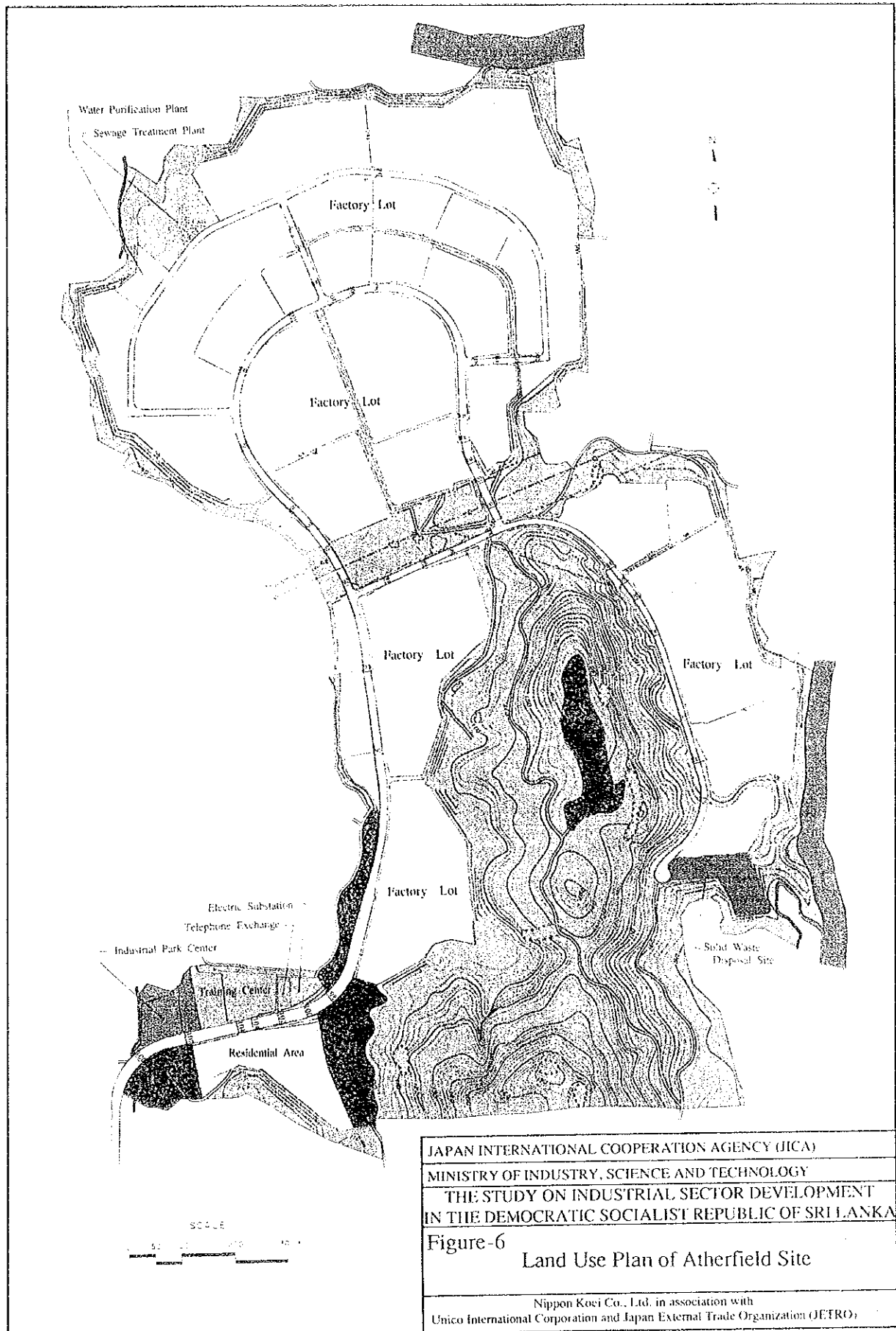
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	THE STUDY ON INDUSTRIAL SECTOR DEVELOPMENT IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
	Figure-5 Location of New Industrial Estates
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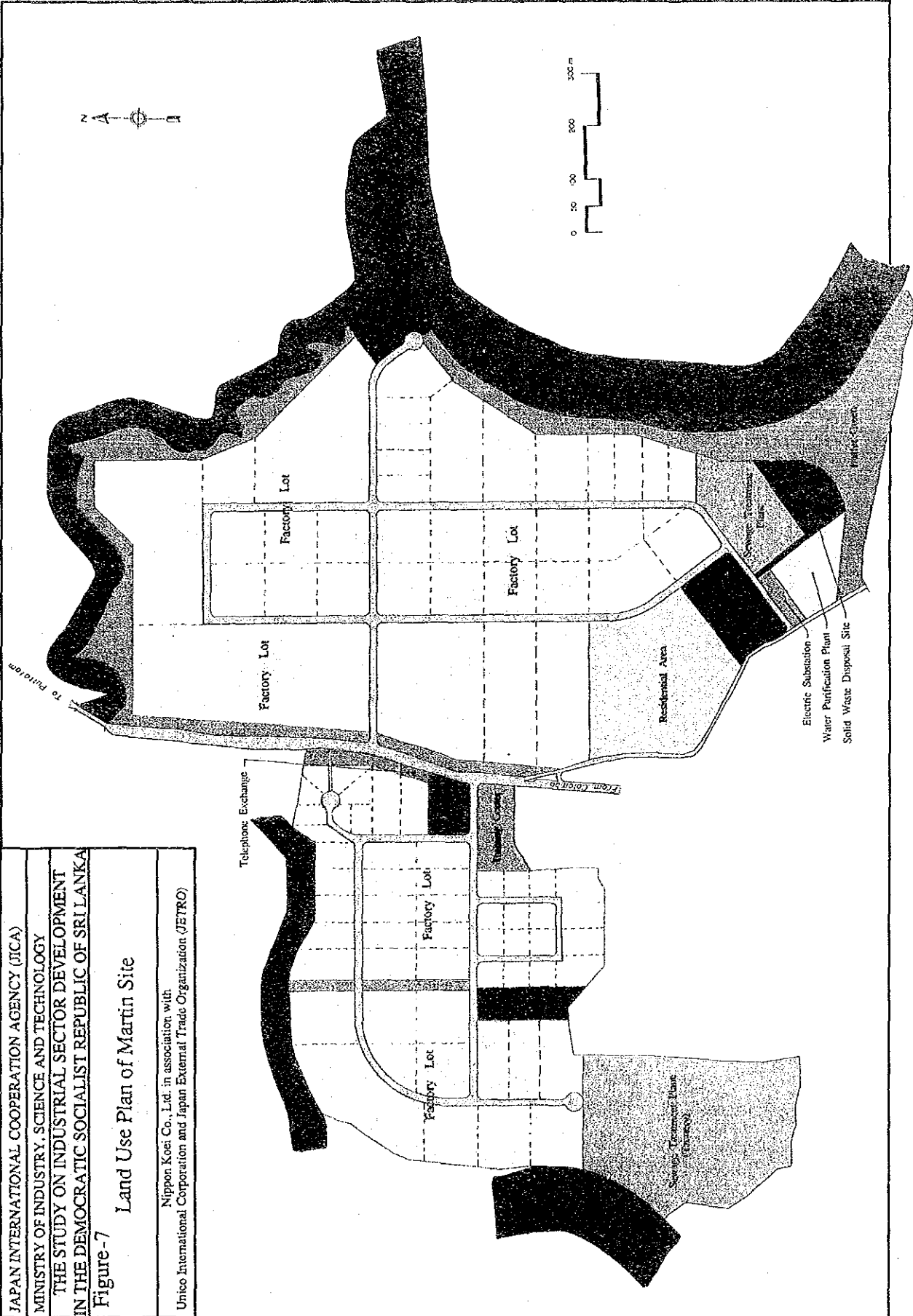




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 IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

Figure-7
 Land Use Plan of Martin Site

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