

No. 4 • 1969

**asian industrial
development
news**



UNITED NATIONS

ASIAN INDUSTRIAL DEVELOPMENT NEWS

The **Asian Industrial Development News** is a regular publication of the United Nations. The **News** contains current information pertaining to the following:

- Industrial development plans
- Research
- Investment opportunities
- Trade opportunities
- Market data
- Economic policies
- Trade and economic agreements
- Regional projects sponsored by AIDC

The **News** maintains correspondents in each of the member countries and the authoritative information it contains will be of use to:

INVESTORS — BUSINESSMEN — RESEARCH STUDENTS —
RESEARCH INSTITUTIONS — AND STUDENTS OF ASIAN
AFFAIRS

The **News** also contains research papers on economic and technical matters of relevance to industry. Copies are available for sale at Agents of United Nations publications in various countries. (Cost per copy is approximately US\$1.50 or the equivalent in national currencies, depending on the total number of pages of each issue.)

For further particulars, contact your Sales Agent or write to the Editor, Asian Industrial Development News, United Nations ECAFE, Industrial Studies Section, Division of Industry and Natural Resources, Sala Santitham, Bangkok-2, Thailand.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of the frontiers of any country or territory.

ECONOMIC COMMISSION FOR ASIA AND THE FAR EAST
Bangkok, Thailand
ASIAN INDUSTRIAL DEVELOPMENT COUNCIL

No. 4 · 1969

asian industrial development news

- **News from the Asian Industrial Development Council**
- **Regional news in brief**
- **Industrial planning and programming**
- **Iron and steel directory**
- **Research news — rice-bran oil industry — science and technology**
- **Articles — Industrial integration among developing countries**
- **Selected short-term industrial indicators**



UNITED NATIONS, New York 1969

E/CN.11/867

UNITED NATIONS PUBLICATION

Sales No.: E.69.II.F.14

Price: US\$1.50 or the equivalent in other currencies

FOREWORD

With the fourth issue of the *Industrial Development News*, the first instalment of the directory of industrial projects is being issued. This issue also provides selected short-term industrial indicators.

The directory, the first part of which covers the iron and steel industry, is intended ultimately to include all major industries of the region. It is being issued in its simplest form with the most elementary information on projects. On completion of this initial exercise, a more analytical evaluation of industrial sectors will be undertaken. The analytical evaluation is intended to provide practical guidance in industrial management economics. The directory will, therefore, be a base from which to commence operations on a much wider project involving sectoral analysis of industries in the region as a whole.

The selected short-term indicators will cover growth on a bi-annual basis and include indices of industrial growth rates and growth rates in selected industrial commodities. The short-term indicators have been prepared in respect of textiles, paper, chemicals, cement and crude steel and they include several important sub-items within these broad categories. The data are presented on a six-month basis with the relevant comparative data for the equivalent period of the past year.

On the technical side, this issue provides fuller details of a subject which has been discussed generally in the past issues, namely, rice-bran oil extraction in the ECAFE region. The main article, which pertains to industrial integration among developing countries, discusses the experiences gained in other areas in the process of industrial integration with specific reference to the ECAFE region.

CONTENTS

Part I

NEWS IN BRIEF

	Pages
Asian Industrial Development Council	1
Study group for coconut industry	1
Iron and steel institute for South-east Asia	1
The private sector participation in industrial development	2
Summary of the Council's decisions	2
Twenty-first session of the Committee on Industry and Natural Resources/	3
Regional news in brief	4
Notes on industrial planning and programming	14

Part II

RESEARCH AND TECHNOLOGY

Science and technology	17
Research problems—Rice bran oil industry in the ECAFE region	18
Development in the field of power in the ECAFE region	24
Small Industries Service Institute, Thailand, Summary of	25

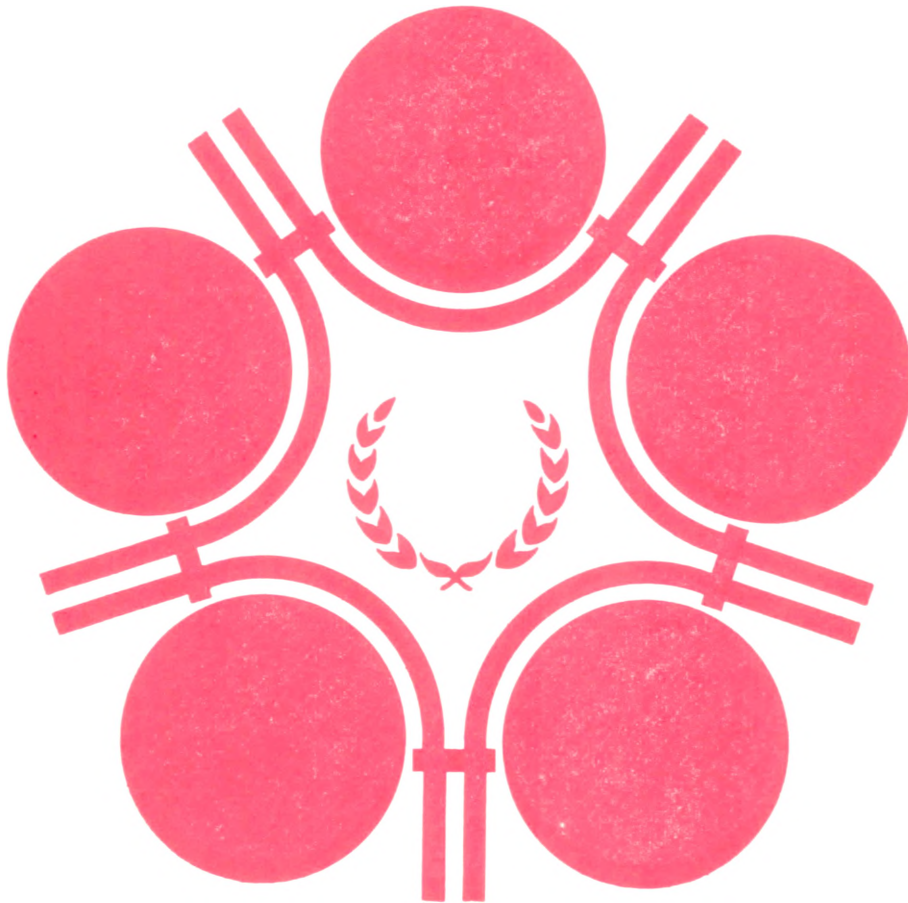
Part III

ARTICLES

Industrial integration among developing countries	29
Iron and steel directory of the ECAFE region	53
Selected short-term industrial indicators in the ECAFE region	70
Calendar of ECAFE meetings on industry and natural resources in 1969/70	75

ASIA69

SECOND ASIAN INTERNATIONAL TRADE FAIR
5-24 OCTOBER 1969
TEHRAN IRAN



Part I

NEWS IN BRIEF

ASIAN INDUSTRIAL DEVELOPMENT COUNCIL NEWS

Study Group for Coconut Industry

The Asian Industrial Development Council at its fourth session held at Bangkok (12-18 February 1969) decided to set up an expert study group for the coconut industry. The decision was based on a recommendation of the *ad hoc* Group of the Council on the coconut industry which met on the 15 February, 1969. The *ad hoc* Group consisted of Cambodia, Ceylon, India, Indonesia, Pakistan, the Philippines and Thailand and an observer from UNIDO was also present. The representative from Ceylon, Mr. J.H. Lanerolle, acted as Chairman of the *ad hoc* Group.

In deciding to set up an expert study group as opposed to organizing a fact-finding mission, the Council was of the opinion that the purpose of the fact-finding mission was fully covered by the terms of reference of the Advisory Council for Industrial Research¹.

The secretariat was requested to collect the data now available at the level of individual countries in respect of research, development plans and programmes as well as general economic and commercial data. In recommending the setting up of a study group, the Council suggested that experts from UNIDO, FAO and other appropriate international organizations, in addition to experts from individual countries, should be included. The study group is to be set up immediately and it is expected that its report will be available by about September 1969.

In addition to what is being done in connection with the coconut industry as such, the Council also recommended that a world market survey on chemical derivatives of coconut oil be undertaken by the appropriate United Nations organizations. The study is to be related to those derivatives which could be produced commercially within the region.

Iron and Steel Institute for South-east Asia

The Council accepted the recommendations of the Working Group on Iron and Steel Industry in South-east Asia pertaining to the establishment of a South-east Asia iron and steel institute.

¹ See Summary of conclusions below for terms of reference of the proposed study group.

The Working Group recommended as follows:—

- (1) The geographical coverage of the proposed institute shall in the first instance cover the six south-east Asian countries — China (Taiwan), the Philippines, Indonesia, Singapore, Malaysia and Thailand and other interested countries in the ECAFE region, e.g. the Republic of Korea, Japan, New Zealand and Australia. The Council also decided to set up a similar institute to cover West Asia, but recommended that this task should wait until the south-east Asian institute had been set up.
- (2) That the services of an expert from Australia and of one from Japan, offered free of cost to the Council, should be accepted to assist the secretariat in the preparation of the framework and objectives of the south-east Asian iron and steel institute.
- (3) That the experts should:
 - (i) Consult industry and appropriate government agencies in the above countries on the objectives, activities and general organization of the institute.
 - (ii) Investigate and report on the facilities and costs involved in establishing the headquarters of the institute in one of the six countries. The site will be decided upon later by these six countries.
 - (iii) Draw up a draft constitution and by-laws for the institute.
 - (iv) Advise the secretariat on further preparatory arrangements for the inaugural meeting of the governing body of the institute. It is suggested that the inaugural meeting of the governing body be held in 1970. The Working Group, while appreciating the generous offer of the Governments of Japan and Australia, expressed the hope that the two experts would be made available at an early date, before June 1969.

The Council recommended that the secretariat convene a meeting of a preparatory committee at an

appropriate date and that the members of the committee include officials concerned with the iron and steel industries in the respective countries.

Private sector participation in industrial development

In order to promote investment in regional and sub-regional joint enterprises, the Council decided to activate the interests of the private sector by increasing the extent and scope of the information supplied on AIDC projects and by establishing firmer connexions with the private sector through conferences on joint ventures among private entrepreneurs of the region on a sub-regional basis.

ECAFE is now making preparations for the first meeting of private sector industrialists to be held some time in the 70s. The preliminary objective will be to acquaint entrepreneurs of the region with the prospects for expanding investment on a joint basis in selected multi-national industries, and to establish a forum for contact so as to initiate joint consultations among private sector investors. It need hardly be said that at present capital mobility within the region is limited. Several east Asian entrepreneurs have been participating in industrial ventures, particularly in the less developed areas of the region, but this has amounted merely to scratching the surface of the vast reservoir of potentialities. Foreign private entrepreneurs are taking active steps to set up investment organization. (see notes on Developments in Regional Co-operation in the section entitled Regional news.) In order to take advantage of the developments in regional co-operation, Asian entrepreneurs must of necessity build up investment organizations in view of the fact that joint venture investments require considerable co-ordination of matters involving national and multi-national interests.

Summary of the Council's decisions

Iron and steel

The Group of Six (China (Taiwan), Indonesia, Malaysia, Singapore, the Philippines and Thailand) should meet early to discuss suitable procedures and methods for implementing the recommendations of the feasibility studies undertaken in 1968.

The Group of Six had agreed in principle to establish a South-east Asian iron and steel institute. Australia and Japan had offered to provide one expert each to work out the details for the establishment of the proposed institute. The inaugural meeting of the governing body of the institute may be held in the latter part of 1970.

Western ECAFE region

A full fledged AIDC Iron and Steel Survey Mission should be organized and sent to Ceylon, India, Iran and Pakistan and possibly to Afghanistan and Nepal.

Panel of experts

An advisory panel of experts should be established in the secretariat for advising the countries of the region (on request), on steel technology and related matters.

Petrochemical industries

The Group of Eleven (China (Taiwan), Brunei, India, Indonesia, Iran, the Republic of Korea, Malaysia, Pakistan, the Philippines, Singapore and Thailand) should meet at ECAFE headquarters within four months to discuss the projects identified by the AIDC fact-finding team on petrochemical industries and to select projects for detailed feasibility studies.

Forest-based industries

More facts should be collected on forest resources, production and potential, and on the status and growth of industry. For that purpose, the Governments concerned should designate a liaison officer to assist the secretariat in collecting such information.

A regional survey of the hardwood resources in insular south-east Asia should be organized.

With the assistance of the Asian Standards Advisory Committee, a sub-regional standardization of grading rules and standard designs in manufactured products should be worked out and steps should be taken to set up a sub-regional forest and export promotion organization.

Assistance should be sought for converting the rayon pilot plant at Bandung, Indonesia, into a regional research centre, and a detailed feasibility study for the establishment of a sub-regional newsprint mill at Takengon in Indonesia for sub-regional use should be undertaken.

Agricultural machinery

The highest priority should be given to projects aimed at increasing the production of low-cost power tillers and tractors and their attachments. A team should be organized to carry out pre-investment studies on these items.

A panel of experts should be established to investigate the form and content of the assistance required to improve the quality of castings and pumps and foundry practices and also the development of essential ancillary industries.

The industries for the manufacture of rice processing machinery deserve special attention, and a survey team should be formed to visit all rice growing countries for that purpose.

A technical study team on rice paddy tractors and power-driven wheat threshers should be organized to visit Pakistan and other interested countries.

Coconut industry

The Council, acting on the recommendation of the Group of Eight (Cambodia, Ceylon, India, Indonesia, Malaysia, Pakistan, the Philippines and Thailand), decided to organize an expert study group to examine the prospects of technological development in the coconut industry, with the terms of reference recommended by the Asian Council for Industrial Research which are as follows:

- (i) To make a survey of the available statistics on the production of coconut and of processed coconut products with a view to ascertaining the gaps in current statistical knowledge that require to be filled.
- (ii) To make a survey and evaluation of the unit operation and processes that are now being used in the countries of the region in the manufacture of various coconut products, comprising: (i) copra making; (ii) oil milling, (iii) desiccated coconut manufacture, (iv) refining and processing of coconut oil, (v) coconut fibre processing and manufacturing methods, (vi) coconut shells processing, (vii) any other coconut products.
- (iii) To make a survey and examination of the technological research carried out in the wet process for coconut oil and the reasons for the failure to bring it to the stage of a commercial proposition.
- (iv) To identify areas of research and development work regarding the separation of the protein from oil so as to produce an acceptable and marketable source of protein for human consumption, as well as a better grade of oil.
- (v) To study the drying of copra in such a way as to ensure stabilization and prevent deterioration in quality.
- (vi) To study desiccation of coconut kernels with a view to improving the production of exportable desiccated coconut.
- (vii) To study refining and further processing of coconut oil.
- (viii) To study the manufacture of fatty acids and other chemical by-products from supplies of coconut oil over and above the amount needed for human consumption.
- (ix) To examine the need for strengthening existing institutional facilities or setting up additional ones, having regard to minimal essential levels of concentration of facilities and integration of relevant scientific dis-

ciplines, and to the commercial, managerial and financial expertise necessary to effect the transition of research and development work to actual production.

- (x) To identify the areas of research and development work which have to be covered in order to fill in the gaps in existing knowledge so as to make the application of already known and imported technology more effective for this purpose, as well as to undertake original basic applied research with a view to arriving at processing innovations and to developing new processes or improved processes specifically suited to local conditions.

A world market survey on chemical derivatives of the coconut oil should be undertaken by an appropriate United Nations organization, or competent international authority.

Rice bran oil

An expert study group should be set up to study the extraction and processing of rice bran oil as recommended by the Advisory Council for Industrial Research.

TWENTY-FIRST SESSION OF THE COMMITTEE ON INDUSTRY AND NATURAL RESOURCES

The twenty-first session of the Committee on Industry and Natural Resources was held at Bangkok from 19 to 26 February 1969. Among the items discussed by the Committee were:—

- (1) Review of industrial growth rates with specific reference to the development problems of ECAFE developing countries.
- (2) Exports of manufactures and semi-manufactures.
- (3) Application of science and technology to development.
- (4) Reports of the Sub-Committees on
 - (a) Energy Resources and Electric Power
 - (b) Development of Mineral Resources
 - (c) Second United Nations Inter-Regional Symposium on Iron and Steel Industry
 - (d) Housing, Building and Planning
- (5) Activities of other United Nations bodies in the field of industry—UNIDO, AIDC, CCOP and offshore prospecting.

Deceleration of industrial growth rates

The Committee expressed concern at the steady decline in industrial growth rate from 8.8 per cent (1960-63 average) to about almost 3 per cent (1966/

67). Basically, however, many countries of the region had achieved a satisfactory degree of industrial advancement and maturity and this was reflected by the increasing share of added value in manufacture contributed by the heavy industries sector as against the light industries sector. In 1960, the light industries sector had contributed 60 per cent of the total output. In 1966, its share of contribution had declined to 58.7 per cent, as against which the heavy industries sector had increased its contribution from 36 per cent to 41.3 per cent for the respective years. Despite this progress, however, both sectors (heavy and light) were marked by excessive concentration on a few industries and a widening gap between the developing member countries. "The stagnation of industrial development in the lagging group of countries posed a great problem and emphasized the need for greater regional co-operation and intra-regional sharing of experience."

In regard to current problems of industrialization, discussion centred around six aspects which needed priority consideration:—

- (1) The inter-relationship between agricultural and industrial growth,
- (2) Training in manpower skills, with particular reference to management,
- (3) Under-utilization of capacity,
- (4) Supply of external service facilities and maintenance imports,
- (5) Shortages in domestic and external savings, and
- (6) Problems connected with industrial programming and planning.

Oils and fats and chemical derivatives of coconut oil

The Committee showed great interest in exports of manufactures and semi-manufactures which had become a regular item on its agenda. It recommended that, in addition to continued studies pertaining to marketing techniques and measures for further studies on a commodity basis, a study in depth be made of oil and fat commodities of the region including coconut oil and that this study be combined with the world market survey of the chemical derivatives of coconut oil as proposed by AIDC.

The Committee also recommended that (1) seminars with exporters as the main participants be held to facilitate exchanges of information on experience, (2) the developing countries establish export promotion information centres in order to provide advisory services to prospective exporters of manufactures,

(3) the ECAFE secretariat prepare a comprehensive survey which would indicate the extent to which member countries of the ECAFE region could meet their requirements for specific industrial commodities from one another.

REGIONAL NEWS IN BRIEF

Developments in regional co-operation

Despite several unfavourable international economic factors, the year 1968 may prove to have been a watershed for Asian industry. In the sphere of regional co-operation, both ASEAN and RDC¹ have taken significant steps towards consolidating earlier objectives into concrete forms for definite action in many directions. The ECAFE Ministerial Meeting (11-14 December 1968) took the historic step of setting up the Council of Ministers which will provide the foundation for practical decisions to be taken on the basis of the continuing studies in the sphere of regional projects.

The April meeting of the RCD Ministerial Council held in Tehran overshadowed the earlier problems that confronted the formulation of a common trade policy. The Council agreed that joint industrial projects studied by the RCD Sub-Committees should be presented to Governments for final approval. The projects include the production of electronics, transformers, radio equipment, tea machinery, earth moving equipment, dumpers, concrete mixers, machine tools, gear boxes and clutch systems, steering systems, differential systems, shock absorbers, aluminium sheets, steel pipes and tubes and sodium tripolyphosphate. The Council accepted petroleum processing, heavy machinery and electrical equipment as new items for scrutiny by the relevant Sub-Committees. The important Irano-Turkish transit agreement came into force on 21 May, 1968; this not only provides for non-discrimination against the goods of either country in the other but also facilitates the passage of goods in transit to other countries outside the region.

Work on the RCD aluminium project proceeded satisfactorily—the project received a further boost with the discovery of substantial quantities of bauxite in Fars and South Esfahan. Work on the banknote paper factory in Pakistan reached an advanced stage with machinery being installed in July 1968.

Despite these gains, much remains to be done towards further integration in the economic sphere. The most serious issues pertain to trade expansion among the participating countries. Both Pakistan and Turkey have strong trade ties with the Commonwealth and EEC countries. At the same time Iran has

¹ ASEAN and RCD are two sub-regional organizations. The former consists of Thailand, Indonesia, Malaysia, Philippines and Singapore and the latter of Iran, Pakistan and Turkey.

pursued a policy of close commercial and industrial collaboration with India, particularly in the field of petrol-chemicals where joint ventures between the two countries have been promoted. Turkey's commercial agreements with Iraq have caused some uneasiness.

It is believed that a second Ramsar summit conference will soon be convened to renew progress and to iron out the difficulties that have arisen during the past years.

The five nation ASEAN held its annual convention at Jakarta in August 1968 and decided to set up several permanent bodies to study aspects of co-operation in the field of food production, communication and transportation. The convention also decided to study a proposal to establish a development fund to promote specific projects in the member countries. In October, representatives of the member countries agreed to set up a working group to study the prospects for establishing a common market in south-east Asia.

Against the background of these developments, the decision of the Ministerial Conference in December to set up a Council of Ministers assumes greater significance. The problems undoubtedly are both multifarious and complex, and the real issues of fruitful co-operation tend to be submerged by the ever increasing flood of national problems. If success is to be assured, the primary task is to condition the attitudes of all Asian people to an appreciation and acceptance of the perspectives of regional co-operation in the wake of rapidly changing international economic relations.

It is also encouraging to note the interest evinced by the developed countries in the development of the region. Already three financing agencies have or are in the process of being set up with the specific purpose of investing in the region's industries. A \$40 million investment company based at Tokyo is to be set up this year by the Asian Confederation of Chambers of Commerce and Industry. Investment funds will be made available from United States, European, Japanese and Australian banks and private agencies. A similar project with United States, Canadian, New Zealand, Australian and Japanese funds with a capital of \$20 million, known as the Private Investment Company for Asia (PICA), is to be promoted this year. A third financing organization has been set up by Rothschild & Sons, a Netherlands Antilles investment Company known as the Pacific Seaboard Fund N.V. This company will have one million shares of \$20 each with participation from Japan, Australia and the United States West Coast. The associates are Nomura Securities Co.; Merrill Lynch; Pierce, Fenner and Smith; Banque de Paris et des Pays-Bas; Manufactures Hanover Ltd.; Pierson, Heldving and Pierson.

Institutions for financing form an integral part of the promotion of regional projects. The Asian Con-

ference on Industrialization held in 1965 recommended several steps both at national and regional levels to build up the necessary financial infrastructure to facilitate industrial development. It recommended that, "special efforts should be made to provide underwriting facilities for the floating of new issues" . . . and that ". . . special investment corporations to undertake underwriting of shares and stock should be considered". It also recommended that AIDC should, in dealing with implementation of regional projects, consider the setting up of bi-national or sub-regional industrial development corporations.

Country Notes

Japan — emerges as second largest industrial power

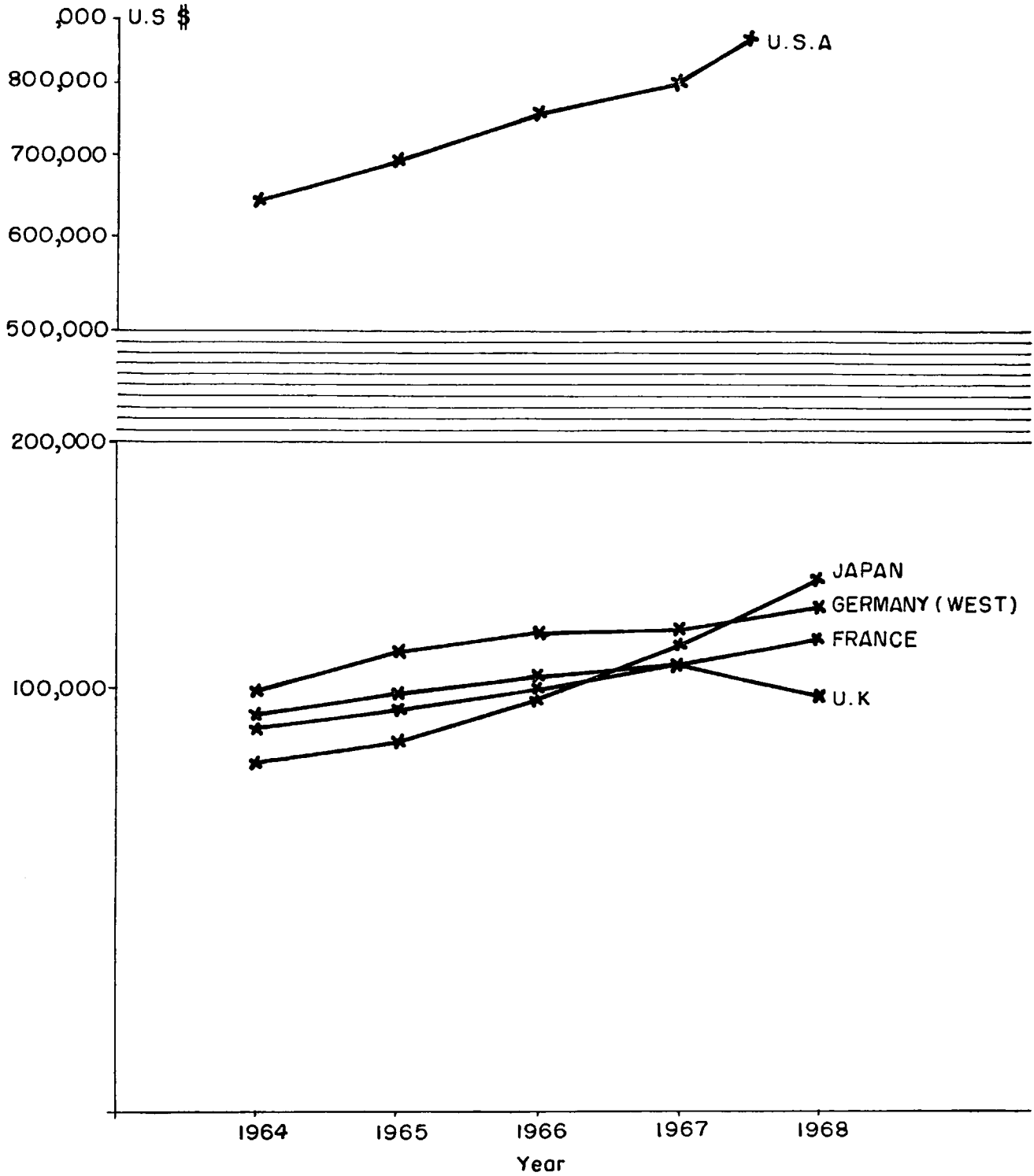
Japan, which consistently maintained its annual growth rate at 10 per cent over the last decade, has become the second largest industrial power among the developed countries. It is estimated that the 1968/69 growth rate will reach a record of 10.5 per cent. The tremendous expansion and the consistently high rates of growth have been maintained mainly upon a solid foundation of export industries and successful planning.

Industrialists envisage fundamental changes in the growth structure of the Japanese economy in the coming years which are likely to interest the developing countries of the region. The most important is the impact of rising labour costs upon several key labour intensive industries. An evaluation made by the Times of London shows that the percentage share in United States imports between 1964 to 1966 in respect of several labour intensive industries has dropped to the advantage of Hong Kong, China (Taiwan) and the Republic of Korea, e.g.,

	Japan	Hong Kong, China (Taiwan), Republic of Korea
Transistor radios . . .	- 9.5	+ 10.0
Rubber and plastic toys	- 3.5	+ 5.4
Rubber footwear . .	- 10.2	+ 17.5
Sports shirts	- 5.9	+ 5.8
Dry batteries	- 11.0	+ 13.0
Binoculars	- 2.6	+ 3.0

Apart from rising labour costs, growing international protection, particularly in the United States, and problems of export financing are likely to cause a change in the pattern of Japanese exports from labour intensive industries to capital intensive exports such as general and electrical engineering industries. It is also likely that direct and portfolio investment, which was in the region of \$US150 million in 1968 as against trade credits of over \$US700 million, will increase—a transfer of both hardware as well as software is likely to take place in the coming years.

GNP AT CURRENT MARKET PRICES



Indonesia — Foreign investment in mining and natural resources

Preliminary investigations into the prospects of mineral exploitation in Indonesia may prove to be, if all goes well, the beginning of a mineral boom in the country and the opening of a new chapter in the Indonesian economy. For centuries Indonesia has been known to possess vast resources of mineral wealth—copper, nickel, bauxite and tin to mention a few—but up to now hardly any attempt has been made to exploit the country's resources due mainly to the lack of capital. The Government's efforts to win the confidence of foreign investors has paid dividends. In 1967, following upon the signing of the law on foreign capital investments, a contract was signed with Freeport Sulphur for exploitation rights for copper in West Irian. Initial drillings for mineral resources indicate the existence of copper, iron ore, silver and gold. In 1968, International Nickel of Canada signed an agreement for exploitation of nickel at Sueawesi (Celebes); the investment is estimated to be in the region of US\$100 million. In the same year, offers were under consideration for exploration of tin in Bangka and Singkek islands. The largest contract is with a Japanese consortium for undertaking a joint venture for the reclamation of 37,000 hectares of jungle involving an

estimated US\$257 million, of which actual investments are to be in the region of US\$40 million (US\$20 million for manufacture). The scheme involves the development of manufacturing industries, communications, fisheries, oil extraction and forest development.

Other joint ventures in the manufacturing field include fertilizer, textiles, detergents, assembly and manufacture of bicycles, cement, timber exploitation and food processing (milk powder, wheat flour, artificial rice and agricultural equipment).

By the end of 1968, contracts involving investments of US\$350 million were signed of which approximately US\$160 million was in respect of mining projects.

India — Engineering industry forges ahead—further progress in fertilizer production.

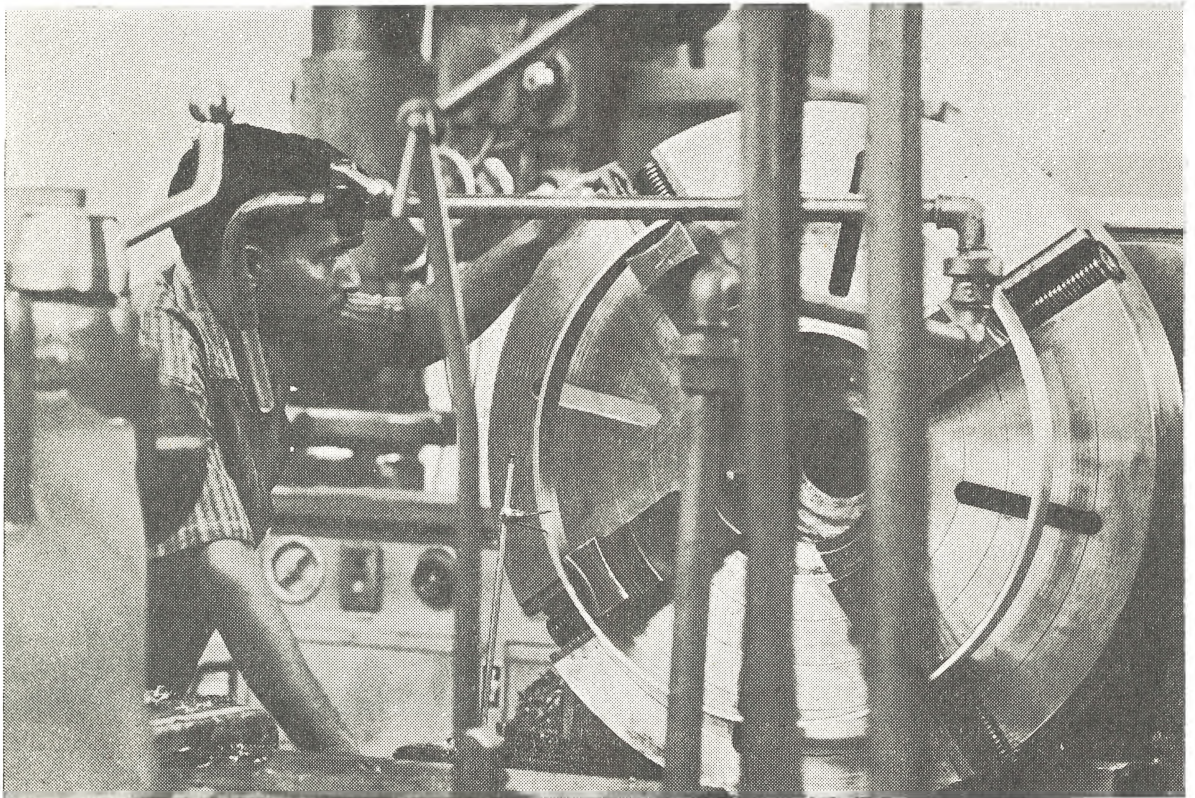
In 1966 and 1967, the Indian engineering industry was in the doldrums. Production levels had reached the lowest limits with exports coming to a virtual standstill (see No. 3, 1968 News). During the first half of 1968/69 production was almost at maximum capacity with exports reaching an all time high of Rs383 million as against Rs132 million for the corresponding period of the previous year. It has been



Indonesia's Leather Institute: Trainees work in one of the laboratories. In the foreground is a spray-drying unit.



View of the TISCO Works (India) across the Cooling Tank.



estimated that the export performance for the whole year will reach approximately Rs750 million. The principal export items are pipes and tubes, electrical wires and cables, railway wagons and coaches, automobiles and bicycles, small tools and diesel engines. The rapid progress in the engineering field indicates India's ability to handle successfully such problems as competitiveness and quality in standards and servicing which are vital factors in external trade success.

An important breakthrough is India's success in the United States where it has won a contract for the supply of 7,300 tons, amounting to US\$1.34 million, of extra high tension voltage 500kV special design power transmission lines in 1968. The shipments are to be completed in 1969. The firm (KAMANI Bros. of Bombay) has specialized in the supply of power transmission lines and, since 1960, has exported US\$16 million worth of equipment. Bhilai, one of India's largest steel plants, has been exporting steel products (78,000 tons) to Iran, Turkey, New Zealand, Sudan, Ghana and Malaysia. Another contract was recently signed to supply 16,000 tons to Turkey.

It is estimated that fertilizer consumption in India at the end of the fourth plan 1973/74 will amount to 3.73 million tons, which is more than double the present 1968 consumption of 1.7 million tons. Present consumption (1968 actual) of phosphatic and potassic fertilizers is 0.65 mn tons and 0.45 mn tons respectively. Consumption of these items would also more than double to an estimated 1.74 mn tons and 1.11 mn tons respectively.

Production of fertilizers in 1968 amounted to about 600,000 t/N against a capacity of 840,000 t/N. Capacity of approved projects which includes expansion is 2.17 mn tN/y, and a further 1.45 mn tN/y is under consideration. The approved projects include the coal-based US\$180 million plants to be set up at Korbar and Ramagundam—with 900 tN/D of ammonium sulphate and 1,500 tN/D of urea respectively.

The importance of the fertilizer industry is demonstrated by the volume of imports and the extent of foreign exchange commitments involved. Imports in 1968 amounted to 1 million t/N valued at US\$300 million. Imports are expected to continue at this level upto about 1970/1971.

Hong Kong — From plastics to iron and steel

Hong Kong has earned a world-wide reputation for its quality products, ranging from textiles to plastics and wigs. It has remained for many years one of Asia's most versatile producers of such items; but little known are its concerted efforts to strengthen its industrial structure by creating a supporting iron and steel industry which today has a capacity of 400,000 t/y,

much larger in fact than that of many of the larger countries of the region. There are sixteen steel rolling mills in Hong Kong employing 825 people, but only one firm is equipped with electric furnaces for scrap smelting. In 1968, two of the larger mills completed expansion schemes boosting production capacity to 190,000 tons between them and one of these, with a capacity of 100,000 tons/y (steel billets, bars and castings) has installed a 25 ton electric arc furnace with an "S" type curved mould continuous casting machine.

Hong Kong exports about 75,000 tons/y and continues to import large quantities of special items for domestic use.

Philippines — New incentives for industrial promotion

The Government of the Philippines has introduced a new law under the "Investment Incentives Act" (R.A. 5186) which entitles both foreign and domestic investors as well as industrial firms to liberal tax incentives. The law provides for two categories of enterprise, registered and pioneer, and in addition special export incentives are provided for registered enterprise. The legal entitlements are as follows:—

I. Incentives to a registered enterprise

1. Deduction of organizational and pre-operating expenses from taxable income over a period of not more than ten years beginning with the month the enterprise begins operation.
2. Accelerated depreciation.
3. Net operating loss incurred in any of the first ten years of operation may be deducted from taxable income for the six years immediately following the year of such loss.
4. Tax exemption on imported capital equipment.
5. Tax credit equivalent to 100 per cent of the value of the compensating tax and custom duties that would have been paid on the domestic capital equipment had these been imported.
6. Tax credit for taxes withheld on interest payment on foreign loans.
7. Employment of foreign nationals.
8. Deduction from taxable income of undistributed profit reinvested for expansion during the year.
9. Anti-dumping protection.
10. Protection from government competition.

II. Incentives to a pioneer enterprise

Furthermore, pioneer enterprises are granted the following incentive benefits:

1. Exemption from all taxes under the National Internal Revenue Code, except income-tax; gradually decreasing from 100 per cent up to December 31, 1972 to 10 per cent up to December 31, 1981.
2. Post-operative tariff protection to an extent not exceeding 50 per cent of the dutiable value of imported items similar to those being manufactured or produced as pioneer items.

III. Special export incentives for registered enterprises

Registered enterprises whose main product will be exported shall be entitled to three special export incentives namely:

1. Deduction from taxable income of twice the amount of the promotional expenses abroad;
2. Deduction from taxable income of twice the amount of shipping cost of export goods;
3. Special tax credit equivalent to 7 per cent of the cost of raw material and supplies used in the manufacture of exported products and commodities or the amount equivalent to the taxes actually paid, whichever is higher.

IV. Incentives to investors in a registered enterprise:

1. Protection of patents and other proprietary rights.
2. Exemption from income-tax on that portion of the gains realized from the sale, disposition, or transfer of capital assets (capital gains).

V. Incentives to Philippine nationals investing in pioneer enterprises

1. An investment allowance to the extent of a person's actual investment paid in cash or property shall be allowed as a deduction from his taxable income, but must not exceed 10 per cent thereof.
2. Exemption from income-tax of capital gains invested in new issues of capital stock or in purchase of stock owned by foreigners in pioneer enterprises, within six months from the date the gains were realized.

Basic rights and guarantees

In addition to the basic rights and guarantees provided in the Constitution, all investors and enterprises are entitled to:

A. In case of foreign investments:

1. the right to repatriate the entire proceeds of the liquidation of the investment in the currency in which the investment was originally made and at the exchange rate prevailing at the time of repatriation.
2. the right to remit earnings from investment at the exchange rate prevailing at the time of remittance.

B. The right to remit at the exchange rate prevailing at the time of remittance such sums as may be necessary to meet the payments of interest and principal on foreign loans and foreign obligations arising from technological assistance contracts.

C. Freedom from expropriation by the Government of property represented by investments or of the property of enterprises except for public use or in the interest of national welfare and defense and upon payment of just compensation.

D. Freedom from requisition of investment except in the event of war or national emergency and only for the duration thereof.

Thailand — Busy year for the Board of Investment

Thailand's Board of Investment approved a record of 176 investment proposals during 1968 and issued 107 promotion certificates. The total investment will amount to approximately US\$90 million, of which domestic capital will provide the bulk of the required finances, amounting to nearly US\$60 million. While the bulk of the applications have been for light industries, mainly textiles and food processing, some significant heavy industries are included in the December approvals. Apart from the proposals for expansion of three existing motor spare parts manufacturing units, a plant for the manufacture of caustic soda and chlorine by the electrolytic process, a plant for the manufacture of nylon filament and a plant for the production and dressing of manganese ore have been approved. The caustic/chlorine plant to be located at Samut Prakarn will have a capacity of 12,900 t/y of caustic soda—which means approximately 10,000 t/y of chlorine-acid and 15,000 t/y of the hydrochloric acid. The project is estimated to cost US\$1.25 million. The manganese ore dressing plant to be situated in Narathiwat province, will have a capacity of 80,000 t/y. The total capital investment will be approximately US\$550,000. The nylon filament plant, which will cost nearly US\$2 million, will have a capacity of 1,800 t/y.

Plans have been completed for two industrial estates in Thailand. One is to be developed by the Government close to Bangkok and the other to be promoted by a private enterprise (a Thai-Dutch organization) in Chonburi on the Gulf of Thailand. The latter is to be built in two stages on reclaimed land and will cost nearly US\$55 million. Work on the Government estate has already commenced. The total cost will be about US\$1.5 million and, apart from housing and other facilities, provision will be made for 127 small and medium scale industrial units.

Thailand's Department of Science has been actively engaged during the past two years in planning, organizing and training staff for the setting up of a standards institution. Twenty-seven technical committees have been set up for the purpose of drafting industrial standards. The bill for the control of standards which is now under review by a Senate committee will apply not only to local products but also to all industrial goods in the domestic market.

Pakistan — Shift in strategy of industrialization pays dividends

Pakistan's third five-year plan (see notes on Planning) came up against several unforeseen difficulties in 1968 mainly arising from the serious agricultural setback in 1967. The country's food import bill had risen in 1966-67 to Rs770 million. Planners had in consequence taken a hard second look at plan priorities. The result of the strategy of improving the capital-output ratio was a much better use of installed industrial capacity and a new crop of agro-based export-oriented industries. Investment plans for most of the capital intensive industries were revised or postponed. The plan envisaged an industrial growth rate of 15 per cent, which has not yet been reached but the rate for 1967/69 increased to 13 per cent, or more than double the rate for 1965/66 (6 per cent).

Pakistan's policy of export diversification not only by product but also by destination has greatly helped its balance of payments as well as its manufacturing industry. Whereas in the 1950s 90 per cent of the country's exports constituted raw jute and raw cotton, today the export of manufactures and semi-manufactures comprises 45 per cent of the trade. Barter deals account for 10 per cent of total exports—against imports of much needed capital and producer goods, the country exports cotton and jute manufactures, woollens, leather and leather products, canned fish and vegetables, chemicals such as DDT, chlorine and soda ash.

Despite the setback of investment in the heavy industries sector considerable progress has been recorded during the last year. The Kalabagh iron and steel plant (see News No. 2, 1967) based on the 125 million tons of proved iron ore resources has finally been given the green light by the government. A

scheme for the 500,000 t/y steel as well as 60,000 t/y of high grade phosphate fertilizer has been finalized. The total cost is estimated at Rs. 1,399.10 million. Soviet assistance to cover the foreign exchange cost of Rs. 906.45 million has been secured.

In the important fertilizer field a new 345,000 t/y urea plant to be set up at Lahore has been approved. Production will be based on local natural gas. The total cost of the project has been estimated at US\$78 million and the World Bank and I.F.C. have agreed to provide upto US\$36 million.

Ceylon — Industrial production reaches new peak

Industrial output in Ceylon in 1968 surpassed that of 1967 which was the highest on record. The contribution in 1967 was almost double that of the average contribution in the past years which had been a mere 6 per cent GDP. Recent estimates indicate that the actual contribution would be in the region of over 10 per cent of GDP. The most important factor has been the fuller utilization of existing capacities in both public and private sector industries. It is reported that for 1967/68 production of paper at the Eastern Paper Mills Corporation was 105 per cent of capacity—total capacity is 9,000 t/y writing and printing paper, the Oils and Fats Corporation 95 per cent of capacity, cement 88 per cent, ilmenite 87 per cent, building materials (tiles and bricks) 85 per cent, plywood 77 per cent. The steel plant is expected to reach 66 per cent of capacity in 1968. The success of tyre and tube manufacture has been demonstrated by the fact that the state corporation has been able to sign a contract with Pakistan for export of 15,000 tyres and tubes in 1969 to that country.

The Ceylon State Hardware Corporation has prepared plans for the setting up of an integrated metallurgical plant. Work on the project is to commence in 1969. The projects include a 5,000 t/y malleable cast iron foundry and manufacture of 3,000 t/y of high carbon and steel alloys. The Corporation will also produce drop stamped forged items and castings for a bus and lorry chassis manufacturing plant. The Corporation proposes to set up a sponge-iron manufacturing plant with a capacity of approximately 25 - 30,000 t/y to meet its own needs which by 1970 is estimated to be in the region of 20,000 t/y.

China (Taiwan) — Exports of manufactures exceed planned targets

Exports of processed goods from China (Taiwan) for the first 3 quarters of 1968 reached US\$286 million exceeding the total for the corresponding period of 1967 by 33.4 per cent. Chemicals and electrical machinery US\$46 million and US\$19.9 million) showed increases of 70 per cent and 52 per cent respectively. Consignment processing moved up to

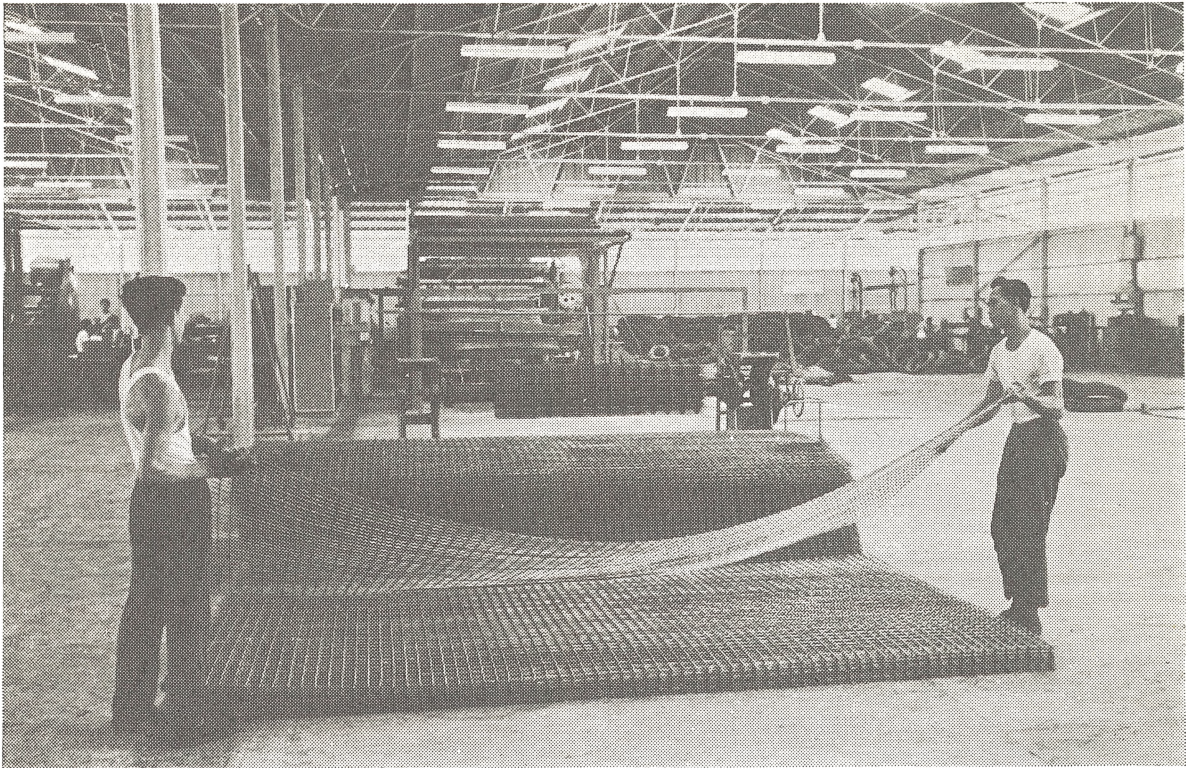
US\$38.2 million increasing by 73 per cent. Textiles the largest single item increased by 27 per cent to US\$105 million and wood products increased by 40 per cent to reach US\$40 million. Estimates indicate that exports of canned goods will reach a record of US\$85 million. A ten year plan for increasing canned foods to 420,000 t/y has been approved by the Government and export revenue is expected to increase from the present US\$85 million to US\$290 million.

The success of the first export processing zone, Kaohsiung Export Processing Zone (KEPZ) has prompted the Government to set up a similar zone at Nantzu (10 miles north of Kaohsiung). KEPZ which was established in 1966 had been planned for 120 industrial units but already 123 have been approved and 68 are in operation. Total employment which will amount to 28,953 will exceed the planned target of 15,000. The new project at Nantzu will be larger with provision for 150-180 factory units.

Evidence to the fact that the country's heavy industry is receiving greater attention at present is shown by the approval of a new petro-chemical complex and an integrated iron and steel mill. The new petro-chemical complex, a US\$15 plant at Kaohsiung to be set up by USI-Far East Corporation, a subsidiary of National Distillers and Chemicals of America, is designed to produce 72 million lbs p/y of low density polyethelene (PE) based on ethelene from the State Petroleum Corporation. The plant will supply raw materials for the growing plastic industry and save the country over US\$4 million p/y. A company was also established in October last year to promote a US\$250 million integrated iron and steel mill to be completed in three stages. The first stage envisages an investment of US\$95 million over a period of four years for rolling 550,000 t/y steel, a building and steel making plant (2nd stage), for 1 million t/y is to be completed in 1976, the third stage is the doubling of capacity by 1983.



Ceylon's Ceramic Industry: General view of casting section at the Negombo factory.



Singapore: A scene in the new weldmesh factory in the Jurong area.



A floating dry-dock of the Jurong Shipyards Ltd—the largest industries in the Estate with ship-building and repair facilities.

NOTES ON INDUSTRIAL PLANNING AND PROGRAMMING

Iran

Iran's fourth plan—a five-year development plan—was approved by Parliament in 1968 and will be in operation till March 1973. The plan envisages a gross fixed capital investment of 810,000 million rials and a gross production increase from US\$260 million (1968) to US\$360 million (1973). The expected annual growth rate is 9 per cent; while per capita income is expected to increase from US\$220 to US\$304.

Fifty-five per cent total fixed capital investment is to be spent in the public sector and the remaining 45 per cent in the private sector. Of the total allocation of 125.3 billion rials for mining and industry, a sum of 26,334 million rials is for petroleum and natural gas—the balance for industry and mining constitutes nearly 20 per cent of the total allocation for development. The fourth plan's allocation for industry is thus the highest so far. The third plan (seven years), the total of which was less than 50 per cent of the fourth plan, allocated only 12 per cent for mining and industry.

Planned and Actual Expenditure — First and Second Plans

	First plan (1949-1955)			Second plan (1958-1962)		
	Estimated Expenditure (billion rials)	Percentage of Total	Actual	Estimated Expenditure (billion rials)	Percentage of Total	Actual
Agriculture/irrigation	7.3	27.8	5.7	18.9	21.7	17.4
Transport/communications	7.7	29.3	3.5	30.4	34.8	27.3
Industry/mining	5.3	20.1	4.1	6.7	7.7	7.0
Social services	6.0	22.8	0.8	11.7	13.4	9.3
Regional development	—	—	—	12.2	14.0	8.6
Other	—	—	—	1.2	1.4	0.4
Total development	26.3	100.0	14.1	81.1	93.0	70.0
Total non-development	n.a.	n.a.	n.a.	6.1	7.0	13.2
Total expenditure	26.3	100.0	14.1	87.2	100.0	83.2

Allocation for Third (September 1962 – March 1968) and Fourth (March 1968 – March 1972) Plans, in billion rials

	Total allocations, by sector		
	Third plan	Fourth plan	
Agriculture/irrigation	49.0	65.0	
Industry/mining	28.6	125.3	(including 26,334 million rials for petroleum and natural gas)
Power/fuel	36.5	86.5	(including 48,500 million rials for water development)
Transport/communications	59.5	100.3	(including 20,330 million rials for telecommunications)
Education	18.1	35.0	
Manpower/training	3.2	...	
Health	13.5	13.8	
Urban development	7.5	7.6	
Statistics	1.7	1.0	
Housing	12.4	24.0	
Other	—	25.5	
Total	230.0	480.0	

Apart from the emphasis given to industrial development, the plan has ensured the successful implementation of the industrial programme by introducing integrated targets for various sectors, including guidelines for budgets in each sector. The major schemes within the public sector include iron and steel, gas pipelines, a machine-tool factory (see the *News* No. 3 1968), an aluminium reducing plant, three petrochemical plants and the assembly and manufacture of automobiles. One of the petrochemical plants, a polyethelene plant, is to be built with technical and economic collaboration from ICI and another at Shapur, with help from West Germany, for which DM34 million has been negotiated. The 45,000 tons per year aluminium plant is being set up in collaboration with Renolds Iran and Pakistan. Besides these, the plan also provides for a new Iranian Jeep factory at Tehran, and four diesel-engine plants to be opened at Tabriz, two of which will be provided by firms in the United Kingdom, one by a firm in the Federal Republic of Germany and one by a firm in Czechoslovakia.

Indonesia

Indonesia's five-year development plan (1969/70 – 1973/74) became operative with effect from April 1969. One of the main features of the plan is self-sufficiency in food production, for which the Government has placed the heaviest emphasis on agricultural development through substantial investments in irrigation, supply of fertilizer and agricultural implements. Equal importance is attached to the exploitation of the country's natural wealth, which necessitates the development of mineral resources, forestry and forest products and fisheries. Forest products are expected to become one of the country's principal foreign-exchange earners of the 1970s. In infrastructure, investment of the building of new highways is limited, the emphasis being on the rehabilitation of existing roads. With regard to industry, the main emphasis is on the development of labour-intensive industries.

The plan provides for a total investment of Rp 1,420 billion (One US dollar = 350 Rp), of which

the public sectors' contribution will be Rp 1,059 billion and the private sector's Rp 361 billion, the latter including both domestic and foreign private capital. A total of Rp 380 billion is allocated to industry, of which the Government's investment is placed at Rp 130 billion and the private sector's at Rp 250 billion. The planners have estimated an average growth rate of 5 per cent (gross).

The principal industries for which increased production targets have been determined are textiles, fertilizers, cement, paper, tyres and tubes and petroleum.

In textiles, the plan provides for 600,000 new spindles to be in operation by the end of the period. In cement, the increase in output will be based upon a doubling of output at the Padang plant, the completion of the Tonasa plant and a new factory to be built at Tjipinong with a capacity of 400,000 to 500,000 tons per annum.

It is envisaged that the implementation of the industrial plan will come up against a great many difficulties. At present, industrial capacity utilization is estimated at 30 per cent, the main factors for this being power and transport difficulties and lack of foreign exchange for the purchase of essential materials and spares. In addition, the existing equipment is considered to be obsolete.

Pakistan

Pakistan's third five-year plan (1965-1970)—the first stage in the twenty-year perspective plan—had by 1968 come up against considerable difficulties, due in particular to serious shortfalls in the public sector investment programme. The gross allocations were reduced from Rs 34,500 million to Rs 31,000 million, and industry, fuels and minerals were reduced from Rs 5,160 million to Rs 4,150 million. Although the net expenditure, after taking into consideration expected shortfalls, remains the same (Rs 30,000 million), the rephasing of expenditure has increased the investment

Production targets of principal industries:

Industry	Base year and annual output		Annual Production target for end of plan	Percentage increase
Textiles	1969/70	450 million metres	900 million metres	100.0
Fertilizers	1969/70	46,500 tons N	403,500 tons N	767.0
	1971	18,000 tons, phosphatic	168,000 tons	833.0
Cement	1969/70	600,000 tons	1.65 million tons	175.0
Paper	1969/70	16,000 tons	166,500 tons	940.6
Tyres	1969/70	625,000 units	1.5 million units	140.0
Crude petroleum	1969/70	293 million barrels	400 million barrels	50.1
Tin	1969/70	16,200 tons	19,400 tons	19.9
Bauxite	1969/70	1 million tons	1.2 million tons	20.0

during the last two years of the plan to Rs 1,580 million. The original estimates provided for a Rs 22,000 million expenditure in the private sector but, after the rephasing of expenditure, part of the responsibility has been shifted from the public sector to the private sector.

Of the total of Rs 52,000 million (US\$11 billion) committed, Rs 16,000 million (US\$3.5 billion) or 32 per cent was expected from foreign assistance. By mid-term foreign assistance had fallen to levels below 50 per cent of expectations. Non-consortium sources have, however, indicated assistance which is likely to make up the deficit. The domestic resources gap had increased from the expected Rs 2,500 million to Rs 4,000 million.

The shortfall in foreign assistance had been particularly felt in the industrial sector. In view of the fact that expenditure during the first three years of the plan reached only 41 per cent of the plan targets, planners anticipate a shortfall in total expenditure of about Rs 5,000 million. Nevertheless, investment in the third plan will be more than 75 per cent of that in the second plan.

The successful implementation of the third plan is of crucial importance, as this is the first step in the implementation of the objectives of the twenty-year perspective plan, 1965-1985. The main objectives of the twenty-year plan are:

1985 — GNP — Rs 174,300 million

Per capita income Rs 932 per annum—with parity of income between East Pakistan and West Pakistan.

Full employment, universal literacy and total independence of foreign aid.

China (Taiwan)

Details of the Republic's fifth plan (four-year plan, 1969-1972) have not been released as yet, but the Government expects the resources needed for the Plan to be US\$4.5 billion. The plan is a continuation of the fourth plan, with the main emphasis upon industry and an increase of the gross national product, though at a moderate 7 per cent per annum. The total investment is 60 per cent more than the outlay of the fourth plan.

The Government anticipates that US\$730 million will come from foreign sources, which will comprise US\$500 million in loans from ADB, IBRD and other banks and US\$230 million private foreign and overseas Chinese investment.

The building up of a heavy industries sector and an adequate infrastructure will receive high priority. Petrochemicals and iron and steel (see country notes under *Regional News*, above), have already attracted the attention of investors, and the large US\$250 million integrated steel-mill will be one of the major schemes. In addition, provision will be included for expansion of the Republic's shipbuilding capability and the establishment of atomic power plants.

Industrial growth in the Republic has been successfully based so far on agricultural development, and more than 40 per cent of total exports have been comprised of processed agricultural goods. Accordingly, much of the plan's emphasis will be on the agricultural sector. Proposals are reported to include the large-scale utilization of fertilizers and application of modern techniques in both management and cultivation, and rice yields are expected to increase to between 11-13 tons/ha.

Part II

RESEARCH AND TECHNOLOGY

Science and technology

Report on Protein of the Advisory Committee on the Application of Science and Technology to Development

The Science and Technology Unit of ECAFE assisted the secretariat of the Advisory Committee on the Application of Science and Technology to Development in the distribution, to various government organizations, private institutions and persons concerned with protein in the member countries of ECAFE, of the printed report entitled *International Action to Avert the Impending Protein Crisis*. The report describes the "protein gap," gives seven policy objectives for increasing and improving the quality of protein from conventional and new sources, and makes fourteen specific proposals for attaining the objectives. It describes the role of the United Nations bodies in promoting the increased production and consumption of protein, as well as those of national governments and private institutions.

The Advisory Committee's Report on Natural Resources

The Science and Technology Unit prepared, for the report of the Advisory Committee on Natural Resources, a passage covering the activities of ECAFE. The report, which was in its fourth draft during the ninth session of the Advisory Committee in April 1968, is entitled "Natural Resources of Developing Countries: Investigation, Development and Rational Utilization." It briefly reviews the present knowledge about natural resources, gives developing countries certain policy guide-lines for developing such resources, describes the role of the United Nations family in this field, and identifies areas for specific action. The report was finalized during the tenth session of the Advisory Committee in November-December 1968.

Development of the Coconut Industry in South and South-east Asia

The Science and Technology Unit co-operated with FAO and UNIDO with a view to determining the extent and type of assistance required to establish a coconut research institute in the Philippines. The institute will eventually offer its services also to the other ECAFE countries. The region accounts for about 80 per cent of world copra and coconut-oil production, but the research undertaken to improve both the quality of the products and the economy of the coconut industry through full utilization of other parts of the coconut palm has been insufficient. The

coconut is also a potential source of protein food in which the region is very deficient. Since, furthermore, copra and coconut oil are facing competition from petroleum synthetic products, there is an urgent need for improvement in the quality and possibly a reduction in prices through a better economy of the coconut industry as a whole.

Fourth Session of the Regional Group for Asia of the Advisory Committee on the Application of Science and Technology to Development

The fourth annual session of the Regional Group for Asia of the Advisory Committee was held at the ECAFE quarters, at Bangkok, from 5 to 7 August 1968. The members of the Group attending were Professors Thacker (India), Salam (Pakistan), Kaneshige (Japan) and Keynan (Israel). Dr. Gresford, Secretary of the Advisory Committee and Director for Science and Technology of the United Nations also attended. Apart from ECAFE staff officials and representatives of ECAFE-sponsored institutions such as the Mekong Committee, the Asian Institute for Economic Development and Planning and the Asian Highway Transport Technical Bureau, representatives of the International Atomic Energy Agency, the International Labour Organization, the International Telecommunication Union, the United Nations Development Programme, the Food and Agriculture Organization of the United Nations, and the World Health Organization were also present at the meeting. One of the matters discussed was "institutions within the Asian region for the application of science and technology to development". The difficulties of establishing and maintaining regional institutions were examined.

Another subject dealt with was the World Plan of Action for the application of science and technology to development, described below.

World Plan of Action for the Application of Science and Technology to Development

To accelerate the progress of the less developed countries, the Advisory Committee on Science and Technology recommended the formulation of a World Plan of Action for applying science and technology to the developing process. The Economic and Social Council and the General Assembly of the United Nations endorsed the formulation of the World Plan, which will be concurrent with the Second Development Decade (1971-1980). To achieve the most results from the limited resources it was felt necessary to concentrate on a small number of problems only.

The Advisory Committee selected nine problems or sectors: science development, natural resources, food and agriculture, industry, transport and telecommunications, housing and urban planning, health, education and population. The World Plan will be prepared in four stages: stage I, Current and future programmes of the United Nations system; stage IIA, Needs of developing countries in applying science and technology to their development; stage IIB, Possibilities of meeting the needs and recommendations for action; stage III, Over-all approach, aggregation and problems across the board. The Science and Technology unit prepared the materials for stage I in so far as the current activities of ECAFE were concerned, and is also preparing materials for stage IIA.

UNESCO Conference on the Application of Science and Technology to the Development of Asia (CASTASIA). 9-20 August 1968, New Delhi, India

The Science and Technology unit represented ECAFE at the Conference, which was attended by Ministers of Science, Education and Planning from twenty-six member countries. The Conference reviewed the present status of science and technology in Asia, discussed the prerequisites for the application of science and technology to development; the improvement of science education in the countries of Asia; and science policy and its relation to national development planning. The Conference arrived at important conclusions and recommendations, some of the more significant ones being that (1) Governments of Asia endeavour to reach a minimum level of total national expenditure on research and development of one per cent of their gross national product as soon as possible, not later than 1980; (2) technology transfer and information centres be set up urgently; (3) a permanent machinery be set up, if found feasible, under the auspices of UNESCO together with ECAFE and in collaboration with ILO, FAO, the Asian Development Bank and other international and regional organizations, as appropriate, to keep under regular review, stimulate and facilitate the co-operation of member States for the implementation and follow-up of the recommendations of the Conference, (4) developing countries take the initiative for popularizing science among the people; (5) the social status, image and career prospects of scientists and technologists be improved; (6) centres for advanced studies and research be established at certain universities; (7) applied research institutes develop research links with similar institutes in developed countries; and others.

RESEARCH PROBLEMS IN THE DEVELOPMENT OF THE RICE-BRAN OIL INDUSTRY IN THE ECAFE REGION

Summary

Rice-bran oil is one of the new sources of vegetable oils in Asia and the Far East with a potential of over

a million tons per annum, valued at US\$300 million. The development of this important source of edible oil has been hindered by a number of technical and economic problems. There is need to carry out research on various aspects of the rice-bran oil industry, starting with the rice-milling operation, with the object of producing bran of higher oil and protein content than at present, so as to make it commercially feasible to extract the oil and utilize the defatted bran as a feedstuff for livestock. In view of the unusual nature of the impurities in raw rice-bran oil, improved methods of refining will have to be employed in order to make the process economical. The recovery of the by-product wax, which has a wide commercial application, will reduce the cost of production of oil. Technical problems involved in the recovery and bleaching of the wax from crude rice-bran oil require further research. It may, however, be mentioned that a new process, known as the X-M process, has been developed in the United States. This is aimed to produce rice bran-oil of edible quality and defatted meal of a high protein content. The merits of this process also are required to be established by suitable experimentation. The nutritive value of rice-bran oil, which is claimed to be superior to the conventional vegetable oils, requires to be further investigated. This fact, when established by scientific research, will give further impetus to the development of the new industry. The utilization of defatted bran as an ingredient in the manufacture of compound feeding stuffs for livestock would also improve the markets for this most important by-product and therefore needs further study. In view of the pre-eminent position of Asia in the production and milling of rice for domestic consumption/exports and of the vast amount of rice bran which becomes available as a by-product but is not properly utilized at present, the proposed research work will be of great regional significance. The promotion and development of the rice-bran oil industry will augment the supply of oil, without the necessity of employing additional land for cultivation of oilseed, coconut, etc. This is also in line with the development of an agro-based industry in the predominantly agriculture based economy of Asia and the Far East.

I. Introduction

The low per capita consumption of 4 kg of edible oils and fats in Asia and the Far East against the minimum nutritional requirements of 16 kg per day makes it necessary to augment the supply of oils and fats from resources which have so far remained untapped. Asia's share of the world production of paddy is more than 50 per cent. One of the by-products of rice-milling, viz. rice bran, which contains 15-20 per cent of oil, has not been fully exploited owing to the economic and technical problems attendant on the development of this industry. The rice mills are outdated in design and widely scattered over rural areas.

This situation affects the quality of the bran and also the collection of sizable quantities of it in order to make the extraction of oil profitable. Some investigation of the existing state of the rice-milling machinery employed and of the improvements required needs to be made, not only in the interest of better production of rice grain, but also to promote the utilization of the by-product bran for the production of good-quality rice-bran oil, and of the defatted bran as a feedstuff for livestock.

Rice bran contains an enzyme called "lipase" which becomes active immediately after the separation of the bran from the grain and, by a process of hydrolysis, transforms the fat into free fatty acids and glycerine; and rancidity sets in if it is stored too long. The conditions of stabilization of the raw rice bran will have to be examined and suitable plants designed for commercial operation.

The refining of crude rice-bran oil is a problem requiring scientific research in order to produce refined and deodorized oil as well as the hydrogenated products for human consumption. The nutritive value of rice-bran oil from the point of view of prevention of deposition of cholesterol in the blood vessels needs to be more thoroughly investigated. The recovery of wax as a by-product from the crude rice bran oil also needs to be examined from the point of view of quality and cost of production.

In the ECAFE region, except for Japan, commercial rice-bran oil production is of comparatively recent

origin. In Burma, China (Taiwan), India, the Republic of Korea and Thailand, although the oil is being produced on a commercial scale, there are many problems associated with extraction, processing and by-product recovery which will have to be tackled in order to make this vast source of oil available principally for human consumption and to facilitate the utilization of such by-products as wax, soap stock and the defatted bran for other industrial uses. In the developing countries of the region, there are distinct gaps in the knowledge of the fuller utilization of rice bran, and therefore scientific research into the matter is of regional importance.

II. Potential

The production of paddy in the ECAFE region is about 140 million tons, against a world production of over 260 million tons per annum. Table 1 gives the figures for the main producers of Asia.

The potential for producing rice-bran oil in the different Asian countries has been indicated in table 2, which is based on the production of paddy. On the basis of total production of paddy of 140 million tons per annum, the availability of brown rice would be 93 million tons, the potential of bran about 8 million tons, and that of rice-bran oil over one million tons per annum. It will be seen that, against this large potential, the actual production is about 120,000 tons or about 10-12 per cent. The major rice-bran oil producing countries in Asia and the Far East are Burma, China (Taiwan), India, Japan, the Republic

Table 1. PRODUCTION OF RICE (PADDY) IN ASIA
(thousand tons)

Country	Production				
	1962	1963	1964	1965	1966
Afghanistan	319	319	380	380	335
Burma	7,665	7,783	8,508	8,055	8,096
Cambodia	2,039	2,622	2,760	2,500	2,376
Ceylon	1,003	1,026	1,054	757	—
China (Taiwan)	2,628	2,623	2,794	2,920	2,902
India	47,871	55,333	58,551	45,921	55,000
Indonesia	13,347	11,764	12,387	14,997	15,750
Iran	700	860	860	860	9,000
Japan	16,895	16,639	16,343	16,116	16,552
Korea, Republic of	4,074	5,079	5,344	4,731	5,900
Laos	510	520	735	740	—
Malaysia	985	943	880	1,104	—
Nepal	2,108	2,108	2,201	2,207	—
Pakistan	14,948	17,724	17,780	17,795	17,811
Philippines	3,967	3,843	3,992	4,073	4,147
Thailand	9,279	10,168	9,640	9,588	10,500
Viet-Nam, Republic of	5,202	5,327	5,185	4,822	4,400
	133,640	144,681	149,094	137,566	Incomplete

Source: Asian Economic Statistics, vol. XVII, No. 4, March 1967 — *Economic Bulletin for Asia and the Far East*.

of Korea and Thailand. Rice-bran oil is not being produced in other Asian countries, except perhaps in Indonesia and the Republic of Viet-Nam. Apart from the main reason for the inadequate development of this important source of oil—i.e. the poor quality of the bran resulting from the comparative inefficiency of the outdated rice-milling machinery employed for the purpose—there are also problems of storage and marketing.

Speaking in general terms, in most rice-producing countries the rice-mills are of small capacity and not equipped to separate the husk from the bran; the resulting mixture reduces the quality of the bran from the point of view both of oil extraction and of its use as a feed-stuff. It is uneconomic to collect the bran from small processors scattered throughout the producing areas. In addition, there are technical problems involved in installing satisfactory solvent extraction plants, refining the oil to upgrade it to an edible oil and competing commercially with traditional vegetable oils which have ready consumer acceptance. Even in the United States it is estimated that, against a potential of 25,000 tons of rice-bran oil, actual production is about 5,000 tons and it is presumed that development is hindered either by the processing problems or by competition from a wide range of traditional oils.

To raise the production and utilization of rice bran closer to their full potential, the areas of research work to be carried out are:

- modernization of the rice-milling units;
- stabilization of the bran to inactivate the enzyme-lipase, which causes hydrolysis of the oil and results in a high percentage of free fatty acids;
- nutritive value of the refined oil compared with that of other oils containing polyunsaturated acids;
- recovery of the by-product wax from the crude rice-bran oil.
- fuller use of the defatted bran as a feed-stuff in the manufacture of balanced rations for livestock.

Japan, by virtue of its comparatively modern rice-milling machinery, produces bran of good quality, and technological advances have been made in the extraction and refining of the oil and in by-product utilization. In most other Asian countries, the know-how is available for extraction of the oil, but other problems have yet to be solved. While experimental work in research laboratories may already be in progress in some countries in Asia, what is required is the development of techniques which are commercially feasible. From this point of view, there is a definite need for taking up research on the production and processing of rice bran as a subject of regional importance.

Table 2. POTENTIAL OF RICE-BRAN AND RICE-BRAN OIL PRODUCTION IN ECAFE COUNTRIES
(thousand tons)

Country	Production		Potential		Production of rice-bran oil ^e
	Paddy ^a	Rice ^b	Rice bran ^c	Rice-bran oil ^d	
Afghanistan	380	253	20	3	—
Burma	8,055	5,364	429	64	20
Cambodia	2,500	1,665	132	20	—
Ceylon	757	509	40	6	—
China (Taiwan)	2,920	1,944	155	23	3
India	45,921	30,583	2,446	370	20
Indonesia	14,997	9,998	799	120	NA
Iran	860	572	45	7	—
Japan	16,116	10,733	858	129	70
Korea, Republic of	4,731	3,150	252	38	6
Laos	740	492	39	6	—
Malaysia	1,104	735	58	9	—
Nepal	2,207	1,469	117	18	—
Pakistan	17,795	11,851	948	142	—
Philippines	4,073	2,712	216	32	—
Thailand	9,588	6,385	510	77	5
Viet-Nam, Republic of	4,822	3,211	256	38	NA
			Total	1,102	124

Source: ^a Asian Economic Statistics, vol. XVII, No. 4, March 1967 — *Economic Bulletin for Asia and the Far East*.

^b Calculated on the basis of a two-third yield of rice grain.

^c Calculated on the assumption of 8 per cent yield of bran.

^d Calculated on the assumption of a 15 per cent yield of oil.

^e Rough estimates; precise figures not available.

III. Rice-milling

The essential operations in mechanical milling are:

- (1) Seed-cleaning,
- (2) Splitting and removal of husk,
- (3) Separation of husked grains from paddy,
- (4) Milling or polishing by a process of scouring,
- (5) Final grading to remove the broken grains.

Hullers combine the operations of splitting and removing the husk. But this is wasteful, for it causes breakage of the rice grains and the bran is mixed with the husk. Shellers, which are more efficient, are of three types: (a) horizontal, circular stone shellers covered with emery, (b) rubber-belt shellers, wherein the paddy is conveyed on a rubber belt under a ribbed steel rotor, and (c) modern shellers with a pair of horizontal rubber rollers rotating in opposite directions at different speeds. Brown rice obtained from shellers can be polished in three types of machine: cone polishers, hullers and modern horizontal whiteners. As at present, in most Asian countries, a large portion of the rice-milling is done in a primitive way, the bran produced is of poor quality and thus unfit for extraction of oil. It is necessary to conduct research into rice-milling machinery in order to develop the equipment best suited to the region as a whole, for the maximum recovery and utilization of rice bran and at the same time for improving the quality and quantity of the rice grain. By this means, the main impediment to large-scale rice-bran oil production will be tackled at its very root.

IV. Stabilization of the raw rice bran

The enzyme-lipase present in the raw rice bran is activated immediately after it has been separated from the grain in the polisher. Depending on the humidity and temperature, the lipolysis or hydrolysis of the triglycerides into free fatty acids and glycerol proceeds at a rapid rate. If the percentage of free fatty acids increases, the oil becomes unfit for refining and use as an edible oil. Collection of the bran is difficult and uneconomic because the rice-milling units use primitive techniques and are widely scattered. While the ideal way would be to modernize the rice-mills, in most Asian countries, this would present a colossal problem involving high capital expenditure, mostly in terms of foreign exchange. Even if attempted in it would probably take one decade or more in most of the developing countries. The alternative is to stabilize the raw rice bran. It has been demonstrated by laboratory research and experimentation that, by removing the moisture and heating the bran to about 110° C, the lipase activity will be destroyed. This process of "stabilization", which should be effected within twelve hours of the production of bran, has

largely remained a laboratory curiosity. There is distinct scope for carrying out research on this aspect of rice-bran processing, in order to evolve pilot plants and develop plants of higher capacity which will be commercially feasible to operate. The crucial point is the cost of stabilization and the competitive aspect of rice-bran oil with other edible oils already in abundant supply in the local markets. Therefore research work should be diverted to achieving this particular objective. The stabilized bran will keep for several weeks even in places of high humidity and temperature, without undergoing any deterioration in the quality of the oil as a result of hydrolysis of the fat. The resulting rice-bran oil will be lower in free fatty acids than seed oils and this will permit its economic refining and marketing as edible oil.

V. Extraction of the oil

The solvent extraction process has been widely employed for extraction of oil from oleagenous materials all over the world. The only way of extracting oil from rice bran on a commercial scale is by that process. Owing to the physical nature of the bran and to the admixture of hulls and fine particles of rice grain, several problems are encountered. Both batch type and continuous solvent extraction plants are used for the extraction of rice-bran oil. There is also the problem of fines, and pelletization has been employed to overcome this difficulty. On the design and construction of the solvent extraction plants, there are many variations. Keeping in mind the conditions prevailing in the developing countries of Asia and the Far East, there is scope for increased research work on the solvent extraction process with a view to achieving the utmost economy and efficiency.

VI. Refining

Refining also presents problems, as rice-bran oil is unlike most other vegetable oils. The presence of a high percentage of free fatty acids and wax requires special processing techniques. The dewaxing process removes mainly wax and mucilaginous materials. With the older method, bag filters were employed. This process does not effect a complete separation of the wax. A better way is to employ solvents, so as to obtain separation of wax oil and dewaxed oil; when worked in combination with a vacuum filter, this gives still better results. There is need to examine the maximum recovery of wax, not only for use as a by-product yield, but also to produce a refined oil of the highest quality.

VII. Recovery of wax

A large fraction of the wax recovered from the crude rice-bran oil is reported to consist of melissyl cerotate. It is similar to beeswax with a M P of

75° C. The waxes can be bleached readily by hydrogen peroxide under certain specific conditions and practically white waxes could be produced. The wax content of rice-bran oil depends upon several factors, such as temperature of extraction, nature of the solvent used, source of the bran, etc. For example, rice-bran oil obtained from parboiled paddy contains much less wax than regular rice-bran oil. In view of the economic importance of the wax, its recovery as a by-product of the rice-bran oil industry will improve the economics of rice-bran oil production. Hence, there is need to investigate the conditions under which wax could be extracted and bleached on a commercial scale.

VIII. Neutralization

The dewaxed oil is treated with an alkali, such as caustic soda, to neutralize the free fatty acids and the soap thus formed is removed in a centrifuge. The separated soap also consists of entrained neutral oil. The processing equipment and the conditions under which the oil is processed will largely influence the yield and quality of the oil. Although oil-refining is a familiar technique, in view of the peculiar nature of impurities of rice-bran oil and the excessive loss of neutral oil in refining by conventional methods, further investigation is needed. The conventional process of refining crude vegetable oils involves: (i) neutralization of free fatty acids, (ii) bleaching and (iii) deodorization. While the known techniques work satisfactorily with traditional oils, rice-bran oil presents problems in the refining process, as is evidenced by the high percentage of refining loss. The free fatty acid content in the rice-bran oil is high, the wax requires to be separated, and the very dark colour will have to be bleached.

IX. X-M process

In the foregoing paragraphs the problems encountered in the development of rice-bran oil industry have been dealt with. According to one view, the stabilization of raw rice bran is a futureless proposition; instead, it is recommended that the new X-M process be adopted.

The solvent extractive milling process, or X-M, results from the development of a new technique for milling as applied to rice in the United States. Research and experimentation are required to establish the profitability of adoption of the new process in the developing countries of Asia and the Far East.

Principles and purpose

Until a few years ago rice had always been milled from the brown or bran-coated state to white or milled rice by mechanical abrasion and pressure. From early methods, involving little more than a mortar and pestle, evolving through the use of animal power, steam and electricity, the method of supplying useful energy

has become more sophisticated and efficient, but the method of milling itself has remained relatively unchanged.

Conventional milling inherently has involved a relatively high formation of brokens through mechanical destruction of the head rice or whole grains to form partial grains, fragments, chits, flour and dust, part of which is lost into the bran stream and part absolutely lost to the ambient and sweeps. The broken grains result from a wide number of causes, including particle crushing, *per se*, temperature changes induced by frictional heat and rupture along internal plans of stress set up in the endosperm after harvesting in grain dryers or during dehulling. Since the value of whole-grain rice is usually considerably higher than the value of brokens, the formation of brokens represents a loss in terms of lesser value of mill out-put.

The bran produced in conventional milling, usually containing some rice chits, has been utilized only in animal feeds. In countries in which the dairy and meat industry is not well developed, the bran has represented a complete loss, despite such considerations that its content of rice protein is almost three times as high as that of the white rice kernel or endosperm and that rice protein is a highly digestible, relatively hypo-allergenic and well-balanced protein. The bran, after milling, has been characterized by bitter flavor, poor bacteriological state and extreme instability, as evidenced by rapid onset and increase in rancidity.

A relatively small amount of rice bran, which typically contains about 12 per cent of oil, has been extracted to yield rice-bran oil. This vegetable oil has not been a major commercial oil because of the difficulties in transporting as well as in storing or stabilizing large quantities of bran, because of certain technical difficulties in the extraction process itself and because of the high minimal economic size for the required extractions and solvent recovery systems per unit of oil produced.

Although rice-bran oil had been noted to contain a valuable wax, recovery of this wax has never been commercially developed because of the complex multi-solvent extractions needed and the poor degree of extraction achieved.

In the X-M process, in its almost simultaneous and complete extraction of oil and wax from bran and rice concurrent with removal of the bran from the brown rice, three streams result: rice, extracted high-protein bran and rice oil. The process, in essence, involves a pretreatment in which the bran on the brown rice is softened, then the wet milling of the rice in the presence of an oil-solvent miscella. By the nature of this process, rice is milled with decreased rates of formations of brokens and the oil and high-protein,

relatively pure rice bran are thus, strictly speaking, concomitant-products rather than by-products from further processing.

The objectives of X-M milling are:

- to mill at such relatively gentle conditions that significant increases in head rice yield and in total yield will be obtained;
- to produce as high a yield of rice oil by extraction of the rice as well as the bran during the course of milling;
- to produce a clean, stable high-protein, oil-extracted rice bran which can be utilized as an ingredient in food-processing for human food products.

Basic X-M process

The X-M process does not replace the cleaning and dehulling or shelling of the harvested and stored paddy (rough) rice. In fact, in the operation of X-M, it is important that the dehulling be as complete as possible, since hull entering the pretreatment step will not be removed during processing. The process thus operates on brown rice, which may be fresh, or, under certain conditions of climate and storage, may be stored or stockpiled brown rice.

At the first X-M plant in Abbeville, La, United States, the brown rice comes from old dehulling units in an adjacent building. It is apparent, however, that a number of small dehulling plants at different locations can be used to supply a single centrally located X-M plant.

X-M products

The main X-M products include head rice and brokens, a crude rice oil and a light cream-coloured extracted bran.

The rice is similar to conventionally milled rice in terms of cooking requirements, i.e. time, water/rice ratio. Based on United States home-use testing of unidentified samples conducted using several major domestic varieties of long grain and medium grain rice, a slight preference exists for the X-M rice in terms of its apparent greater whiteness or cleanliness, but this is not felt to reflect in statistically significant preferences over conventionally milled rice based on flavour, texture and other properties.

Rice oil is a semi-drying vegetable oil with potential applications in the paint, edible oil and industrial areas. Its chemical composition is close to that of peanut, cottonseed and corn oils. Produced in the X-M process as a clarified, underwaxed crude oil, it may be dewaxed to yield a crude high-melting wax, and the resultant dewaxed oil can be refined, using

classical techniques to yield cooking oil or salad oil. The dewaxed oil is amenable to standard equipment and processing for deodorizing, decolourizing and winterizing.

The X-M rice bran, while vastly more stable than conventional bran, still has some reactive enzymes, such as lipases, which will cause a gradual free fatty acid build-up as well as oxidative rancidity odours. It may be stabilized completely by the usual steaming to deactivate these enzymes, an operation which may be built integrally into future X-M unit designs. The X-M rice bran, either "as-is" or further stabilized, affords a new building block for creative food technology, offering as it does a good source of highly digestible protein (98-99 per cent in one hour) with a very well-balanced essential amino acid profile and relatively high beta-lysine for a vegetable protein.

Economic aspects

Economic incentives for an X-M installation must be evaluated in terms of a number of key factors by each potential licensee in terms of its own competitive environment.

The capital requirement, of course, depends upon location, volume, use of installation in relation to dehulling and other factors. Very roughly, the X-M system unit for a new 3.25 million cwt/year (paddy rice basis) is estimated at one million US dollars. This is a slightly higher throughput than that of the first X-M unit, which is rated at approximately 2.5 million cwt/year.

The economic advantages of X-M milling of rice are firstly dependent upon the throughput, the varieties being processed, the grade of the rice being processed and the differential price between whole grain rice and brokens in the particular competitive environment. Obviously, for a major milling installation in the United States, where the bulk price of head rice is roughly twice that of brokens, each percentage of head yield increment is a major contribution toward payout or return on investment.

Data to date have been obtained from experiments undertaken in the United States. Varieties processed have included Blue Bonnet, Belle Patna, Nato, Saturn, Toro and a few minor varieties. Head and total yield increments, over conventional milling as measured by "split lots" and other evaluating techniques, have been found to vary with variety and with the quality of the lot. In general, higher yield incrementals are achieved with poorer conventionally yielding lots in a roughly straight-line relationship. Whole grain yield increases of up to 10 per cent have been achieved to date.

Yield differentials and the corresponding incremental value of plant out-turn also depend upon the grade to which the rice is milled. For USDA Grade

US #2, or well-milled table rice, yield increments for X-M over conventional milling are significantly higher than for poorly milled, primarily export grades such as USDA Grade US #5.

The economics are also dependent upon the distribution of rice oil, since the out-turn includes about 2.5 lb/bbl (162 lb) of paddy or just under 2 lb/cwt of brown rice. Since crude corn, peanut, soy and cottonseed oil have traded in the range 10-17 US¢/lb. during 1965-1967, it is reasonable to expect that the price of crude oil should be in this price range. At 12 US¢/lb., for example, a 3.25 million cwt/years (paddy) X-M unit will produce roughly 5 million lb/year of crude oil worth US\$600,000/year. Since the oil would have application, for example, in the paint industry, as refining stock from which to produce refined cooking oil, salad oil, margarine, sulfonation to wetting agents, etc., obviously salability would be dependent upon the existence of and reasonable proximity to edible oil refiners, synthetic detergent sulfonate producers and similar industrial outlets.

The third principle determinant of the economic incentive for X-M milling would be the volume of X-M bran produced and its unit sales value. Since at the present time its sale has been largely to cattle-feed producers at prices comparable to those of regular bran, and its volume is lower with X-M than the bran produced by conventional milling, its contribution to return on investment is negative. As it achieves greater use, because of its property advantages over conventional bran, as an ingredient in formulated foods or becomes exploited as a source of rice protein isolate, its unit sales value and contribution to X-M profitability should be enhanced. Because of the large volume of bran produced in rice milling, even a small increment in bran value represents a major increase in profit potential.

IX. Nutritional aspects of rice bran oil

According to the scientific evidence available, the oils containing polyunsaturated fatty acids are better from the point of view of human nutrition, as they prevent the deposition of cholesterol in blood vessels, the incidence of which will be greater when fats containing saturated fatty acids are ingested. This is one of the biochemical aspects of research in fat chemistry which is receiving considerable attention from the point of view of human nutrition. In fact, it is mainly on account of their high content of polyunsaturated fatty acids that the marketing of corn oil and safflower oil have been intensified in the United States. Research workers in Japan claim that rice-bran oil is even superior to these oils in the prevention of deposition of cholesterol in blood vessels. Intensified research work is called for in order to investigate further the nutritional aspects of rice-bran oil. If it is established by corroborative scientific research and experimentation that rice-bran oil is the most superior vegetable

oil, it may give a fillip to the speedy development of this industry in Asia on a massive scale.

In the foregoing paragraphs, the problems involved in the development of rice-bran oil, principally as an edible oil, have been identified and areas of the research work to be carried out have been indicated. The subjects covered are limited to the production of a refined oil. Research into other branches of fat chemistry such as the splitting of the rice-bran oil for production of fatty acids and their further processing for various uses will also be necessary in the long run, but the immediate objective is to produce edible oil to augment the supply of such oils in the developing countries of Asia and the Far East.

Apart from Japan, considerable research work on rice-bran oil is reported to be in progress in Burma, Ceylon, China (Taiwan), Pakistan and India. Before plans are finalized for further research in the field, it is necessary to pool the existing knowledge and define more clearly the lines on which research has to be carried out in future.

DEVELOPMENT IN THE FIELD OF POWER IN THE ECAFE REGION

Training Course in Load Dispatch Techniques and the Application of Computers to Power System Problems

A significant aspect of the modern methods of electric power development is what is known as the integrated systems which on the one hand permit the unified development of the natural energy resources throughout a given region and on the other ensure provision of reliable and economical power supply to all the consumers within a region. The power-stations of different types within the region are interconnected with one another and with load centres by extra high-voltage lines. The operation and control of the interconnected system is regulated from a central load dispatch office which ensures maximum economy in the generation costs and proper quality and reliability of the power supplied to the consumer. Several countries of the region have already adopted this method and others are seriously considering its introduction.

The planning, design, construction and operation of integrated power systems involve complex technical and economic studies using several variants. The relevant calculations are often too tedious and cumbersome to solve by normal manual methods. In this context, electronic computers for studying power-system problems have been found very helpful, as they can be used not only to solve complex problems but also to regulate and control the operation of machines.

Both in countries which have already developed integrated power-systems and those commencing on this development, there is a pressing need for training facilities in the computer techniques. It is also important to organize appropriate training schemes in methods of load-dispatching and the related operation and control of interconnected power-systems.

The ECAFE secretariat is planning to organize during 1969 a training course on the above subjects for the benefit of regional member countries. The Government of India has offered appropriate host facilities for the proposed training course, by making available the use of computers installed at the Tata Institute of Fundamental Research and the Tata Computer Centre as well as the facilities and services of the Tata Consulting Engineers, Heavy Electricals Ltd., and the various State Electricity Boards. It is expected that the course will accommodate about twenty participants from the countries of the region and will extend over a period of about four weeks. Experts will be invited to deliver an intensive course of lectures on the application and use of electronic computers in power-system problems as well as on load-dispatch techniques. The participants will also be taken on a study tour to observe methods and procedures adopted in load-dispatching and power-system controls.

Dual Purpose Power-cum-Desalination Plant

In arid regions as well as many other areas, the problem of local water-supply for industrial and domestic use is becoming increasingly difficult and expensive. Although as a source of water-supply, the sea has enormous and inexhaustible capacity and could be drawn upon for use in the coastal regions, the cost of conversion of sea water into fresh water is a major factor to be taken into account. Most processes of desalting involve the large-scale use of energy, which raises the ultimate cost of production of fresh water. Economies are sought to be achieved by combining thermal power-plants and water-desalination plants in which the relatively low-grade heat rejected in the process of expansion of steam in the turbines is used for distilling the brine. Needless to say, the economics of such plants are sensitive to the size of the installations. Studies on this subject have indicated that large-capacity nuclear power-plants combined with desalination installation could produce power and fresh water at economically reasonable costs.

At its eleventh session the ECAFE Sub-Committee on Energy Resources and Electric Power recommended that the technical and economic feasibility of regional power-plants be examined. The Sub-Committee had in mind the acute situation of water supply in Singapore as well as the increasing trend of power requirements in Indonesia (Sumatra), West Malaysia, Singapore and Thailand. As a first step in following up this recommendation, the secretariat is at present undertaking with the help of a specialist, a preliminary investigation to ascertain whether or not there is prima facie justification for such a joint project. This study will include, for example, a broad survey of the available sources of energy, the anticipated demands of energy in the coming years, having due regard to development programmes, and the technical and economic feasibility

of developing a power network with interconnections across national boundaries. Depending on the results of this preliminary study, it is proposed to undertake, in due course, a detailed project feasibility report.

Briefing Seminar on Nuclear Power

Taking advantage of the eleventh session of the ECAFE Sub-Committee on Energy Resources and Electric Power, held in Singapore in June 1968, ECAFE and the International Atomic Energy Agency (IAEA) jointly organized a Briefing Seminar on Nuclear Power for the benefit of engineers and economists concerned with electric power development in the ECAFE region. Lectures were organized on the present state of knowledge and experience gained by France, the Union of Soviet Socialist Republics, the United Kingdom and the United States of America on nuclear resources for electric power development. While the technical and economic feasibility of nuclear power had been clearly established, the circumstances and conditions which would justify the installation of nuclear power plants would have to be examined according to the merits of each case.

The participants noted that Japan, India and Pakistan had already embarked on nuclear power development and that there were several areas in the region where it would be worth while giving serious consideration to the establishment, in the near future, of nuclear power plants.

In this connexion, the Seminar recommended that the countries of the region should make systematic surveys of the available energy resources and work out long-term development plans.

It was also recommended that, as a next step, ECAFE and IAEA should organize, according to the convenience of the member countries, a more comprehensive seminar on the technical operating experience and economics of nuclear power. The seminar further recommended that study tours to nuclear-power installations should be organized for power experts of the region. Exchange of scientists and power experts as a means of training was also to be encouraged.

BRIEF SUMMARY ON THE ACTIVITIES OF THE SMALL INDUSTRIES SERVICE INSTITUTE (SISI) OF THAILAND

1 January 1967 - 31 July 1968¹

Introduction

The time-span of nineteen months covered by this summary is divided into three distinguishable periods.

¹ This note has been prepared for the News by Mr. T. W. Lomnický, Chief of SISI (ILO/UNDP) at the request of Mr. Jin Divavi, the Director General, Department of Industrial Promotion, Ministry of Industry, Thailand.

Period I: 1 January 1967 to 30 September 1967

During this period, the Chief of Project and an ILO expert were initiating the Institute's activities. At the beginning the Thai national staff consisted of The Project Co-ordinator and four counterpart specialists (two foundry and two electroplating specialists), they were later joined by four additional Thai specialists who had returned from a fellowship in China (Taiwan).

Period II: 1 October 1967 to 29 February 1968

During this period the ILO team consisted of six experts and one Chief of Project, and the Thai national counterpart staff increasing towards the end of the period. The SISI staff, including the ILO team, were accommodated at the premises of the Ministry of Industry's Department of Industrial Promotion till 17 February 1968, when the entire staff of SISI moved into their new workshop building, on a new site south-east of Bangkok.

Period III: 1 March 1968 to 31 July 1968

During this period the first consignment of workshop machinery was transferred to the new building.

The main initial activity of the ILO team, consisting at that time only of the Chief of Project and the Extension and Training expert, was to assist the Thai staff in surveying small industrial units in the Bangkok and Thonburi area.

Throughout, the Thai staff received advice on methods of approach as well as explanations on various aspects of manufacturing methods, use of material and possible improvements.

Three specific industrial surveys were carried out, i.e. on the foundry industry, the electroplating industry and the tool and die industry. Three techno-economic surveys were made in the following rural districts: Chiangmai, Tak province and Nakorn Phanom province, in order to determine: the extent of existing industry, the extent of economically viable new industries, and the form of assistance that could be given to promote local industry.

An industry location and identification survey also was started during the first period, with all available national staff visiting as many factories as possible to compile a register of companies, location and type of industry. In all, 413 mixed enterprises were located, identified and indexed.

Two ILO fellowship awards of approximately two months each were made to the Director General and the SISI Project Co-ordinator for a study tour of small-scale industries institutes in the Scandinavian countries. During the time they also attended the Interregional Symposium for Small Scale Industries at Vedbaek, in the Netherlands.

The training of Thai staff continued throughout the period, in particular the training and briefing of counterparts in the right approach and procedure of interviewing prospective clients and entrepreneurs and of propagating and explaining the purpose of SISI and the services which it could render. They were also shown how to obtain reliable information, how to diagnose and evaluate the weaknesses and difficulties of small industries and how to apply assistance and induce entrepreneur to accept modernization or modification of his workshop.

In addition, many lecture courses were arranged for the counterparts and attended by them. (See statistical summary.)

In September 1967, the project team was joined by the following ILO experts: an industrial economist and marketing expert, a foundry expert and a textile expert. As a result, the Thai counterpart staff could be assigned according to their technical specialities. This marked the beginning of the implementation of the programme as laid out in the plan of operation for the SISI project, through the formation of:

1. The Extension and Training Division
2. The Industrial Economy Division
3. The Foundry Section of the Workshop Division
4. The Textile Division
5. The Tool and Die Section of the Workshop Division

After the short period necessary for the experts to get acquainted with the environment and to assess the tasks and problems connected with their assignment, each expert drew up and presented his tentative plan of work for the next twelve months, i.e. up to September 1968. After discussion and approval by the national authorities, the plans were implemented. Each plan was designed and balanced to provide training for the Thai counterparts through appreciation courses, lectures dealing with specific technologists, in-plant training and advisory and consultancy service to entrepreneurs. In almost all cases it was possible to adhere to the programme. (See statistical summary.)

The period of consolidation and implementation of the working plans showed that the preliminary training time devoted to the staff had been well spent and that it was now possible to start with extension services in the various industries and with the preparation of entrepreneur courses.

Also during this period, many contacts were made with other institutions and technical colleges in order to prepare the way for inter-institutional collaboration.

A co-operative procedure in the technical evaluation and recommendation of loan applications from entrepreneurs was arranged between the Small Loans Office and SISI.

Towards the end of March 1968 another ILO expert arrived in Bangkok to join the team and to take care of —

6. The Electroplating Section of the Workshop Division.

His speciality is metal-finishing and his task is to advise on the installation of SISI's electroplating shop, to survey and evaluate the problems of the local electroplating industry, and to arrange demonstrations of new processes in order to enable entrepreneurs improve their production processes and the quality of their products. Many of the shops have already been visited by the expert and his Thai counterparts, and assistance has been given by solving some of their problems.

Steps have been undertaken also regarding publicity. A pamphlet has been produced clearly explaining SISI's objectives and the help it can render to the small industrialist, and various articles have been published in the national press. In July 1968, a television programme was devoted entirely to the objectives of SISI.

In the Textile Division much progress has been made in in-plant training, including demonstrations to Thai staff on hand and power looms.

A study tour to north and northeast Thailand, in which the ILO textile expert participated, yielded much useful information which will help to form a basis for the future promotion of the textile industry in those and other rural areas.

In order to ensure smooth implementation of the workplans, guide-lines have been drawn up for the various training activities and a staff training control procedure has been developed. This procedure keeps the training of the Thai staff in balance and contributes also to better administration.

A considerable amount of time has been spent in preparing an up-to-date card-index of enterprises in the metal-working and textile fields. The original data having been taken from the factory control registers and the recent Department of Labour factory census. About 1,600 enterprises with more than five workers are involved so far. An important role is played by the SISI Workshop Division, which at present consists of one Chief of Division, who is a senior Thai national officer, and seven Thai nationals with various technological skills. These staff members take part in the theoretical training courses given by other divisions, and they have started to carry out technical evaluation of loan application in various enterprises. Their primary task concerned the layout, installation, maintenance and running-in of the SISI workshop equipment and machinery. Once the workshop and demonstration facilities have become fully available progress may confidently be expected to accelerate.

Conclusion

When setting the objectives of the project against the work so far accomplished, there can be little doubt that good progress has been achieved. If in addition, the various handicaps encountered during the period are considered, the results are seen to be most gratifying. One can therefore look forward with full confidence to achieving the ultimate goal of the project.

Statistical summary of activities: 1st January 1967 - 31 July 1968

Reports on specific industries	Foundry industry		
	Tool and die industry		
	Electroplating industry		
	Textile industry (weaving)		
	Rural industry (Chiengmai, general)		
	Rural industry (north-northeast Thailand, textile)		
	Industrial and locality survey (Bangkok and Thonburi)	Mixed enterprises	413
	Electroplating shops	55	
	Foundry shops	76	
	Tool and die makers (Spec.)	11	
	Tool and die makers (None spec.)	30	
	Textile enterprises	62	
Enterprises registered courses	Over 1,600		Manhours
	January-December 1967 (12 months)	30	2,940
	January-July 1968 (7 months)	40	1,723
			<u>4,663</u>
Other areas of activity covered	Practical training — Extension		799
	Practical training — Workshop		2,277
	Practical training — Survey		399
	Practical training — Entrepreneur courses		60
	Theoretical appreciation training		102
	Preparation of training courses		486
	Other activities		234
	Total		<u><u>9,020</u></u>
Staff of SISI as at 31 July 1968	Thai staff, total (including administrative personnel, but excluding Textile Division personnel) .	60	
	ILO advisory staff, total (including textile expert)	7	
	Thai staff on fellowship	7	

Part III

INDUSTRIAL INTEGRATION AMONG DEVELOPING COUNTRIES¹

I. Summary and conclusions

Industrial integration is sectoral integration; it is integration of industrial development across national frontiers, so as to achieve the economies of scale made possible by the integration of national markets which, if left alone, would be too small to permit the economic operation of a single plant or enterprise in a given industry.

Among the developing countries, industrialization usually started with import substitution, because of reliance on a captive domestic market, for the production of goods of final demand. However, as industrialization progresses, and enters into the field of intermediates or "process industries" characterized by economies of scale, the domestic market, especially for a small country, is found to be inadequate and has to be supplemented by export markets in foreign countries. In the circumstances, the need for industrial integration among several countries arises.

Industrial integration, which in post-war years started with the establishment of the European Coal and Steel Community in 1952 among the developed countries in western Europe of the Federal Republic of Germany, France, Italy and the Benelux nations (Belgium, Netherlands, and Luxemburg), has spread, albeit slowly, to the countries in the developing regions of the world. The limited achievements to date include the industrial licensing system in the three East African countries of Kenya, Tanzania and Uganda, the regime of integrated industries in the five central American republics of Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua, and the five countries of Argentina, Brazil, Chile, Mexico and Uruguay which are members of the Latin American Free Trade Association (ALALC). In the ECAFE region, a beginning in similar directions has been made by the Asian Industrial Development Council (AIDC), which met for the first time in September 1966 to identify several industrial projects which promise possibilities of co-operation between two or more nations.

For industrial integration among the developing countries to be successful, there appear to be at least three prerequisites, namely, (1) an integrated market under a free trade regime or common market arrangements as in the case of East Africa, Central America and Latin America, (2) similarity in the stages of

development as in the case of Central America, and (3) availability of infrastructural facilities for regional or sub-regional industrialization, which has to be enhanced in order to hasten further progress in Central America.

In industrial integration between nations, several problems usually emerge to affect the course of progress and determine its speed. The first is the choice of industries for integration, for which it is important to keep in mind the objectives of integration, including the gradual adaptation of existing industries to the conditions and dimensions of a regional market, progressive specialization on a national and regional scale, and creation of favourable conditions for existing and new firms to compete in the world market. In view of the scarcity of investment resources and of the pressing need to accelerate their rates of growth, the developing countries should, in attempting to achieve these objectives, also stress the need of channelling the resources towards those sectors which have a key importance for the development process, such as iron and steel, chemicals (including petro-chemicals, fertilizers, and other heavy chemicals), pulp and paper, heavy equipment, fuels, energy and infrastructure in general.

A second problem is the equitable distribution of benefits among participating countries, especially if they are at different stages of development, so that the elimination of trade barriers among these countries will not lead to the concentration of investment in the more advanced developing country, because of the presence of economic and social infrastructure and higher returns on capital. Hence it is important to adopt a number of measures in the field of fiscal incentives, improvement of infrastructure, and establishment of a regional development or financing agency.

A third problem is the formulation and adoption of a regional investment policy. For this purpose it is essential for the participating nations to establish a planning co-ordination committee or a regional development board, which can meet to exchange views on the industries to be established under national plans, and agree on an allocation of industries which could be best undertaken by individual countries from a regional viewpoint. It would also be highly desirable, for the purpose of minimizing the difficulties of agreeing on a regional investment policy, to delimit the scope of the regional industries to (1) new industries suited to efficient operation in a regional market, (2)

¹ Document I&NR/AIDC.2/1, prepared by the ECAFE secretariat for the second session of AIDC, 1967.

industries having great strategic importance for the development process, (3) industries requiring state instead of private investment so as to facilitate decision-making by a single governmental body instead of many private investors, and (4) a "package" of industrial projects covering either various projects or various sectors within which there would be possibilities for giving satisfaction to each participating country.

A fourth problem is the establishment of appropriate regional institutions to conclude and implement agreements on industrial integration projects. In Central America, the establishment of each regional industry requires signature by the five member countries concerned of a protocol to the Agreement on the Regime for Integration Industries, which necessarily takes time and involves delay. In the case of the Latin American Free Trade Association, the organs include (1) the Conference of the Contracting Parties, which is the supreme body meeting regularly once a year to adopt all decisions in matters requiring joint action, and (2) the Standing Executive Committee, which is the permanent organ of the Association responsible for supervising the implementation of the Provisions of the Montevideo Treaty, with a secretariat headed by an Executive Secretary and comprising technical and administrative personnel. This regional structure has not been found satisfactory for the implementation of industrial integration projects in the ALAIC countries. The ECLA secretariat, in a study, declared that "what is proposed is not a political integration but the establishment of community institutions that are more independent, and have more freedom and scope for action, than the existing ALALC organs, without prejudice to any co-operation that might be received from inter-American or international institutions".²

A fifth and final problem is the nature and scope of the agreements to be concluded for the purpose of industrial integration and the need for an agency to formulate and supervise the implementation of these agreements. In Latin America, the industrial complementarity agreements provided in articles 15-17 of the Montevideo Treaty of 1960 have been concluded only twice, owing to the length of time required for complicated negotiations of this kind, the lack of multinational projects in particular sectors, the want of an agency to study and promote such agreements, the lack of promotional provisions and necessary machinery to implement specific provisions for the promotion of a given industry, particularly in regard to supervision of the fulfilment of commitments and to the execution of investment and technical assistance programmes designed to promote new production activities or to facilitate the adaptation of those already existing. Both the ALALC Conference and the Standing Executive

Committee have adopted certain resolutions to remedy the existing shortcomings, and it is hoped that, arising from the decisions (1) to undertake joint programming of industrial development on a region-wide basis, and (2) to permit exceptions to the most-favoured-nation clause and thus facilitate conclusion of sub-regional agreements which appear to offer the likeliest possibilities of complementarity in smaller groups of countries, the pace of industrial integration may be accelerated.

Among the developing regions of the world, the ECAFE region, because of its great diversity in respect of size, population, resources, development, history, culture and political background, is the outstanding exception where industrial integration has not yet taken place. A beginning, however, has already been made by the establishment of the Asian Industrial Development Council in 1966, whose functions are, however, limited; the most important one is "to identify projects where the co-operation of two or more countries is required for the pooling of markets to achieve economies of scale, international division of labour and for the better utilization of raw materials; and to recommend ways and means for the investigation and implementation of such projects". The developing countries of the region have not as yet entered into any free trade arrangements, even on a sub-regional basis, although several regionwise institutions of an infrastructural character, notably the Asian Development Bank, the Asian Institute for Economic Development and Planning, the Asian Institute of Technology, and the Asian Highway, have recently been or are in the process of being established, mainly under the auspices of the United Nations Economic Commission for Asia and the Far East. It is hoped that in the not too distant future, sub-regional economic and industrial integration, for which preparatory steps are being taken by the Association for South-east Asia (ASA)³ and the Regional Co-operation for Development (RCD)⁴, may also come into being and help to hasten the pace of economic growth among the developing nations of Asia.⁵

II. The need for industrial integration

During the post-war years many developing countries have embarked on the course of industrialization to accelerate their rate of economic growth, thereby helping to raise their standards of living. At the early

³ Member states are Malaysia, the Philippines and Thailand.

⁴ Member states are Iran, Pakistan and Turkey.

⁵ At the meeting held from 29 November to 6 December 1966, the First Working Group of Planning Experts on Regional Harmonization of Development Plans, organized by ECAFE in co-operation with the United Nations Department of Economic and Social Affairs, recommended that the strategy of plan harmonization at a sub-regional grouping level involving a limited number of countries be adopted. It also advocated a commodity-by-commodity or sectoral approach at the initial stages of sub-regional plan harmonization, and proposed an organization structure of sub-regional association for plan harmonization and economic co-operation along the lines being pursued by RCD.

² Economic Commission for Latin America (ECLA), "A Contribution to Economic Integration Policy in Latin America" (E/CN.12/728, 20 April 1965), p. 172.

stage of industrialization they generally embark on import substitution, chiefly because of reliance on a captive domestic market. Import substitution enjoys the natural protection of distance and transport costs, makes fewer demands on standards of efficiency, service and quality; moreover, it is facilitated by familiarity with the formerly imported product. It will generally cover goods of final demand. However, as industrialization progresses among the developing countries, the chain of industrial production is lengthened by then entering into the field of intermediates which generally belong to the category of so-called "process industries" where economies of scale play a major role. For small countries with limited domestic markets, and in cases where the need to achieve economies of scale demands large production units, the establishment of a new industry to replace imports can become economical only when export possibilities are also taken into consideration. In the circumstances, the need arises for industrial integration among several countries which are too small to start out individually with the establishment of an industry which requires a minimum optimum scale for economical operation.

In this connexion, the question arises as to the distinction of nations in respect to size. The criteria to be employed may vary from area, population, productivity or national income, to total home market of the country (the product of numbers and of average income). Sometimes, it is relevant to have in mind the size not only of a nation with its home market, but also with its normal export markets. Indeed, as pointed out by Professor E.A.G. Robinson, "what is more important in practice is that a nation that is rich, for reasons of rich natural resources and high individual productivity, can afford to be smaller in terms of population than a less richly endowed country without suffering from the penalties of markets inadequate to sustain efficient production".⁶

In the ECAFE region, most developing countries may be considered as small nations having limited home markets. Aside from the large populous and somewhat self-contained countries of India, Indonesia and Pakistan, the other seventeen developing countries⁷ may be considered small. In terms of population, only 222 million, or one-quarter of the total population of 884 million for the twenty ECAFE developing countries, are to be found in these seventeen countries. In terms of area, 5.06 million km² or 48 per cent of the total area of 10.55 million km², belong to these seventeen countries. All these countries enjoy a rather low level

of national income. With the exception of the oil-producing countries, Brunei and Iran; the entrepôt cities, Hong Kong and Singapore; and the relatively more developed countries, China (Taiwan), Malaysia and the Philippines, the rest of the developing countries in Asia, large or small, enjoyed in 1967 a per capita income of less than US\$150, but generally around the regional average of US\$100 (see table 1).

Significant differences exist between the patterns of industrial activity and structure of larger and smaller countries.⁸ In the first place, certain industries or groups of industries are ordinarily found in larger countries and not in smaller countries. Larger countries normally possess an automobile industry, an aircraft industry, locomotive building, heavy machinery building, both mechanical and electrical. Smaller countries rarely possess any of these industries. Secondly, there tend to be differences in the degree of diversification of industries. In small markets, firms tend to be less specialized and more diversified. Many products are produced within each plant and the firm tends to be more concerned with the problems of shifting production from one product to another as circumstances dictate than with making an outstanding success of any single product. Thirdly, there appear to be differences in the character of competition. In small markets it is easier to develop a monopoly, since the number of firms of minimum efficient size which the market could keep employed is smaller. Fourthly, in almost all the larger economies, the general specialization of firms extends to the specialization of service industries, with additional opportunities for producers to narrow, so far as they may wish, the range of processes for which they make themselves responsible and to extend, with advantages to themselves, their dependence on the services of these specialist firms to the greatest possible extent. These differences, applicable more to the developed than the developing countries, point to the conclusion that "most of the major industrial economies of scale could be achieved by a relatively *high-income* nation of 50 million; that nations of 10-15 million were probably too small to get all the technical economies available; that the industrial economies of scale beyond a size of 50 million were mainly those that derive from a change in the character of competition and specialization—a change which may, if one relies on the contrasts between American and other experience, be explained partly by scale, but may also be attributed to differences of national outlook and to differences in the legal handling of the problems of monopoly, as well as to differences consequent on income and expenditure per head, and due, in part at least, to a richer endowment of natural resources."⁹

⁶ Robinson, E. A. G. (ed.), *Economic Consequences of the Size of Nations*, MacMillan, London, 1960, p. xv.

⁷ These include: Afghanistan, Bunei, Burma, Cambodia, Ceylon, China (Taiwan), Hong Kong, Iran, the Republic of Korea, Laos, Malaysia, Nepal, Philippines, Singapore, Thailand, the Republic of Viet-Nam, and Western Samoa. The centrally planned economies of mainland China, Mongolia, North Korea and North Viet-Nam are excluded, so also are the developed countries of Australia, Japan and New Zealand.

⁸ Robinson, *op. cit.*, pp. xvii and xviii.

⁹ *Ibid.*, pp. xviii and xix.

Table 1. AREA, POPULATION AND NATIONAL INCOME OF ECAFE DEVELOPING COUNTRIES, 1967

Country	Population (thousand)	Area (thousand square kilometres)	Density (Population per square kilometre)	Gross national product (GNP) (million US dollars)	Per capita GNP (US dollars)
Afghanistan	15,751	647	24	...	...
Brunei	84 ^{a, a1}	6	17	66 ^a	790 ^a
Burma	24,229 ^d	678	36	1,618 ^d	67 ^d
Cambodia	6,142 ^m	181	34	733 ^{b, m}	120 ^{c, m}
Ceylon	11,440 ⁿ	66	173	1,718 ⁿ	150 ⁿ
China (Taiwan)	13,684 ^e	36	380	3,595	263
Hong Kong	3,692 ^d	1 ^f	3,578	1,126 ^d	305 ^d
India	501,703 ^{n, g}	3,045	165	32,034 ^{h, n}	64 ^{h, n}
Indonesia	104,879 ^{m, j}	1,492	70	8,909 ^{m, h}	85 ^{m, i}
Iran	26,284	1,648	16	7,439	283
Korea, Republic of	29,784 ^k	98	302	4,559	153
Laos	2,770	237	12	...	...
Malaysia	9,725 ⁿ	342	28	3,034 ⁿ	312 ⁿ
Malaya, States of	8,298 ⁿ	131	63	...	...
Sabah	565 ⁿ	76	7	...	...
Sarawak	862 ⁿ	125	7	...	...
Nepal	10,100 ^m	141	72	665 ^{b, m}	66 ^{c, m}
Pakistan	121,760	947	129	13,228	109
Philippines	34,656	300	116	6,360	184
Singapore	1,865 ^m	0,581	3,210	986 ^{b, m}	529 ^{c, m}
Thailand	34,204	514	67	5,066	148
Viet-Nam, Republic of	16,124 ^m	171	94	2,413 ^m	150 ^m
Western Samoa	135	3	48	...	...
Developing ECAFE Countries ..	883,668	10,545	84	88,660	102

Sources: (1) United Nations, *Statistical Yearbook, 1967*. (2) United Nations, *Monthly Bulletin of Statistics* (Dec. 1968). (3) National Sources. (4) United Nations, *Demographic Yearbook*.

* Census.

^a 1960. ^{a1} Excluding transients afloat.

^b Gross domestic product at factor cost.

^c Per capita GDP at factor cost.

^d 1964.

^e Comprising the Island of Taiwan and the Pescadores.

^f Land area only. Total, including ocean area within administrative boundaries, is 2,916 km².

^g Excluding Kashmir-Jammu, the final status of which has not yet been determined; also excluding Sikkim.

^h National income.

ⁱ Per capita national income.

^j Excluding West Irian.

^k Excluding alien armed forces, civilians, aliens employed by armed forces and foreign diplomatic personnel and their dependents.

^m 1965.

ⁿ 1966.

Industrial integration, as a means of accelerating development, gives rise to a number of advantages—economies of scale, favourable location and specialization, enhanced efficiency and reduction in external vulnerability.¹⁰

The extent to which economies of scale can be realized depends on the nature of productive activity. Thus, the production of non-durable consumer goods which involves little technology and capital, and the production of which is typical for the very early stage of industrialization, often finds adequate outlets within a national market. Particularly large markets, however, are necessary for the production of basic semi-manufactures (iron and steel, non-ferrous metals, heavy

chemicals, etc.), fertilizers, pulp and paper, capital goods (industrial machinery, farm machinery, electrical equipment, transport equipment) and durable consumer goods. The products of these sectors are characterized by the highest income elasticities of demand within the consumption pattern of developing countries. To be precluded by the size of the market from going into these lines of production, or to produce these goods under clearly uneconomic conditions, means to lose some of the most dynamic opportunities for economic growth.

Even for products characteristic of the earlier stages of the import substitution process and involving less technology, such as cement or consumer goods like textiles and footwear, access to larger markets tends to reduce costs greatly. That in developing countries a very large number of industries are working far

¹⁰ UNCTAD, "Trade Expansion and Economic Integration among Developing Countries" (TD/B/85, 2 August 1966), chapter II.

below capacity is another indication that the limitation of the size of the market is an important element in their high cost level.

A region, covering the individual countries that comprise it, has a greater scope for specialization. The advantages of specialization in particular locations of a larger area will be particularly evident in the case of products in the production of which raw materials or energy have a large share, for example, certain chemicals, alumina, paper and cellulose. For sophisticated products such as automobiles and machines, experience likewise shows the value of specialization among producers in a region. The producer of the final product often does not himself produce the various parts, components and accessories but buys them from separate firms which can achieve important economies by supplying various producers of finished products.

Industrial integration also enhances industrial efficiency. As the markets of many developing countries are too small to justify economically the establishment of more than one plant in many industries, the plant that is established in the country usually enjoys a monopoly and has no incentive to increase its efficiency, because of absence of competition under government protection against similar imports. This situation tends to perpetuate itself beyond what would normally be regarded as the infant stage. On the other hand, a wider, regional market would sustain a larger number of efficient production units, and would provide a spur to higher efficiency even in those industries where a larger than national market would be necessary for reaching the optimum economies of scale. The possibility of making comparisons with other producers would then exist, and this would provide an incentive for improving productivity. This abandonment of protection among developing countries forming the region in no way implies that the protection against the producers of the developed countries is also to be given up. Rather, protection should be organized within a wider, regional framework that does not require sacrificing the opportunities of achieving economies of scale, specialization and incentives for operational efficiency.

Industrial integration also reduces the external vulnerability of the developing countries. Stagnation and fluctuations in the purchasing power of the traditional primary exports from the developing countries make it necessary for these countries to diversify their exports both in kind and with respect to destination. Industrialization for export to other developing countries is an important element of this diversification. Inasmuch as this diversification would speed up the industrialization process, the demand for raw materials and foodstuffs would increase and imports of such

products from other developing countries would thus also be stimulated. Exports of industrial products to other developing countries would lessen their dependence upon the developed countries and enhance their capacity to resist the outside shocks occasioned by the characteristics of primary goods trade; their imports of capital goods and basic materials would become independent of the consequences of the fluctuations in the traditional commodity exports.

III. The experiences of industrial integration

Industrial integration has been tried out in both developed and developing countries. Among the developed countries the most outstanding example is the European Coal and Steel Community. The treaty setting up the Coal and Steel Community for fifty years was signed in Paris on 18 April 1951. Belgium, Luxemburg, the Federal Republic of Germany, France, Italy and the Netherlands established a common market in coal and steel by abolishing tariffs, quotas, subsidies, restrictive practices and price discrimination. On 10 August 1952, the High Authority of the Community was established in the city of Luxemburg and, on 10 February 1953, a five-year period began during which the provisions of the Treaty of Paris were gradually brought into effect. The common market was immediately opened for coal, iron ore and scrap. The provisions of the Treaty were extended to common steel in May 1953 and to special steels in August 1954. At the end of the transition period (February 1958) a considerable measure of success had been achieved in breaking down tariff and other barriers which had formerly restricted trade in coal and steel products between the members of the Community. But a single external tariff on coal and steel had not yet been introduced. Those responsible for setting up the Coal and Steel Community were influenced by two basic ideas. The first was the doctrine of free competition. The founders of the Community considered that the efficiency of the coal and steel industries depended upon the existence of mines, plants and wholesale distributors competing with one another. The second idea was the doctrine of supra-nationality. The Governments which signed the treaty handed over to the High Authority certain powers formerly exercised by them separately. The High Authority was given the right to fix maximum and minimum prices and quotas; to inspect mines and plants; and to demand confidential information from firms.¹¹

¹¹ Henderson, W. O., *The Genesis of the Common Market*, Frank Gas & Co. Ltd., London, 1962, pp. 144-146. In regard to the establishment of a single external tariff, the High Authority at the beginning of 1964 adopted Recommendation No. 1/64, requiring peripheral duties on steel to be adjusted to the Italian level of 9 per cent. This recommendation remained in force in 1965, and is considered by the High Authority to "represent for the community a step towards the unification of its tariffs at somewhere near the same level as those of the other major steel-producing and exporting areas." (European Coal and Steel Community, *General Report on the Activities of the Community* (1 February 1965 — 31 January 1966), para. 43.)

Both in Africa and Latin and Central America, the developing countries have resorted to industrial integration in varying degrees. The East African Common Market, comprising three countries (Kenya, Tanzania and Uganda) with a total population of 25 million, was established in the 1920s. When these countries became independent in the early 1960s,¹² internal trade was free with certain minor exceptions and identical tariffs prevailed in each. They had a common currency, freedom of capital movements and financially self-supporting services (railways, harbours, posts, telecommunications, airways) administered on an East African basis. From 1959 to 1964, intra-regional trade grew from US\$20 million to US\$34 million, expanding more than twice as fast as external trade. In 1962, 43 per cent of intra-trade consisted of industrial products, three-fourths of which being exported by Kenya. Industry thus tended to concentrate heavily in Kenya, and Kenya's exports to Tanzania, for instance, in 1964 were 3.5 times larger than its imports from Tanzania.

This lop-sided concentration of industry in Kenya, the relatively most developed member of the East African Common Market, originated from the Industrial Licensing Ordinance introduced in 1948 for the purpose of encouraging "the orderly establishment and setting up of new industries to the best advantage of East Africa as a whole while providing protection to consumers and workers" (part II, section 3(2)). According to one source, "the industrial licensing system rapidly became a means for preventing competition (from Uganda and Tanganyika) with plants already established in Kenya" and "not unnaturally, the latter two countries became unwilling to agree to the addition of any new industries to the licensing schedule under such conditions."¹³

The proposal of the Raisman Commission¹⁴ to distribute the net gains and losses from the customs proceeds from the foreign trade of the area under conditions of intra-trade liberalization did not succeed. The three countries, immediately after attaining independence, entered into negotiations between April 1964 and January 1965 for the still-born Kampala-Mbale Agreement, which provided for dealing with the inequitable distribution of gains from the common market—as reflected in intra-territorial trade imbalances—through an early implementation of five measures:¹⁵

- (a) immediate action with respect to certain inter-territorially connected enterprises, aim-

ed at their shifting productive activities in such a way as to increase production in a deficit country and thereby reduce imports from a surplus country;

- (b) agreement as to the immediate allocation of certain major industrial projects;
- (c) application of a system of quotas and suspended quotas whereby exports from surplus countries would be progressively reduced, and local production increased in the deficit countries according to the building up of the productive capacity of the deficit country;
- (d) increased sales from a country in deficit to a country in surplus; and
- (e) early agreement within the East African Common Market on a system of incentives and equitable allocation of future industrial activities among the three countries.

Although the Kampala-Mbale Agreement established an immediate link between regulation of regional trade flows and distribution of new industrial enterprises throughout the region, it gave first priority to the problem of allocation under the territorial Industrial Licensing Ordinance on the basis of an exclusive licence to a firm operating in the agreed territory. Tanzania was allocated the manufacture of aluminium sheets and foil, tyres and tubes, and radio assembly and parts production. Uganda received the sole rights for the production of bicycles and fertilizers and Kenya was left with the manufacture of electric light bulbs and possibly neon and fluorescent tubes. It was also agreed that the problem of future allocation of industry and differential incentives for new industrial activities would be studied by a regional committee of industrial experts. This committee would draw up lists of "East African industries" according to one of two alternative definitions of their economic feasibility : (a) only if a given industry had access to the entire regional market or (b) only if it needed access to a market larger than that of any one country in East Africa. When examining a possible distribution of these regional industries, particular regard was expected to be given also to the need for an equitable distribution within the region and the concrete industrial location of new projects.

The Kampala Agreement, however, failed and became a dead letter in the autumn of 1965, through the interplay of many internal and external factors. The East African Currency Board, supposed to be converted into a single central bank for the three countries at an early date, actually disappeared from the scene in the spring of 1965 as a result of a unilateral step of Tanzania to establish its own state bank in charge of currency issue and a separate monetary policy, which led, in turn, to a decision of the two remaining countries to end the common currency

¹² Tanganyika became independent in 1961, Uganda in 1962, Zanzibar and Kenya in 1963. In 1964 Tanganyika and Zanzibar united to form the Republic of Tanzania.

¹³ Sidney Dell, *Trade Blocs and Common Markets*, New York, Alfred A. Knopf, 1963, p. 238.

¹⁴ Officially known as the United Kingdom Colonial Office Economic and Fiscal Commission of East Africa.

¹⁵ M. S. Wionczek, "The Experiences of the Central American Economic Integration Programme as applied to East Africa" (CID/SYMP.B/12, December 1965), p. 19.

arrangements in the area in 1966. Kenya's relationship with Tanzania further deteriorated when, shortly after the Kampala scheme had been set up and before its ratification was due (which never took place), Kenya unilaterally withdrew its original approval to allocate to Tanzania an automobile assembly plant, as a consequence of an offer from a group of local and foreign investors to build such a plant in its own territory. This incident forced prolonged multilateral negotiations of a revised list of allocated industries, injected a large measure of bitterness into Kenyan-Tanzanian relations and was largely responsible for Tanzania's putting into motion in mid-1965 the second part of the Kampala agreement providing for the imposition of quota restrictions in case of a persistent trade imbalance with other member countries of the East Africa Common Market. Also, the absence of any progress in respect of a regional uniform treatment of foreign investment, in a region short of financial resources for development, led to a race among the three countries to attract foreign industrial investment under almost any conditions.

In Central America, industrial integration has taken place within the broader framework of a common market among five countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua) with a total population of 12 million. On 10 June 1958, representatives of the Governments of these five countries gathered at Tegucigalpa, Honduras, to sign the "Multilateral Treaty on the Free Trade and Central American Economic Integration". This Treaty established a free trade regime to be perfected within a period of ten years from the date of its enforcement, and called upon the member states to "adopt, by mutual agreement, measures designed to further the establishment or expansion of regional industries directed towards a Central American common market and of particular interest to the economic integration of Central America." In the Agreement of the Regime for Central American Integration Industries, signed on the same date by the representatives of the Governments of the five countries, it is stated that "the Contracting States undertake to encourage and promote the establishment of new industries and the specialization and expansion of existing industries within the framework of Central American economic integration, and agree that the development of the various activities which are or may be included in such a programme shall be effected on a reciprocal and equitable basis in order that each and every Central American state may progressively derive economic advantage." (Article I.)¹⁶

On 13 December 1960, the four Contracting States of El Salvador, Guatemala, Honduras and Nicaragua signed the General Treaty on Central American Econo-

mic Integration,¹⁷ which incorporates the Regime for Central American Integration Industries and reduces the transitional period for the establishment of a free trade regime to five years. According to this Treaty, article XVII, "the contracting parties hereby endorse all the provisions of the agreement on the Regime for Central American Integration Industries, and, in order to ensure implementation among themselves as soon as possible, undertake to sign, within a period of not more than six months from the date of entry into force of the present Treaty, additional protocols specifying the industrial plants initially to be covered by the Agreement, the free trade regime applicable to their products and the other conditions provided for in Article II of the Agreement."¹⁸

According to the provisions of the 1958 agreement on the Regime for Central American Integration Industries, the additional protocol for each industry to be signed by the Contracting States shall stipulate:

- (a) The country or countries in which the industrial plants covered by this Regime are to be situated, the minimum capacity of the said plants and the conditions under which additional plants are to be subsequently admitted into the same or other countries;
- (b) The quality standards for the products of the said industries and any other requirements that may be deemed convenient for the protection of the consumer;
- (c) The regulations that may be advisable as regards the participation of Central American capital in the enterprises owning the plants;
- (d) The common Central American tariffs which shall be applied to the products of Central American integration industries; and
- (e) Any other provisions designed to ensure the attainment of the objective of this Agreement.

The first protocol to the Agreement on the Regime for Integration Industries entered into force in February 1965 for Costa Rica, El Salvador and Guatemala and in August of the same year for Nicaragua. The first two activities to be integrated were the tyre and inner tube plant set up in Guatemala and the caustic soda and chlorinated insecticides plants established in Nicaragua. In November 1965, the five Governments signed a second protocol, extending the benefits of the Regime to a sheet-glass plant to be opened in Honduras.

Also, beginning in 1963, the five Central American republics have established a special system for the

¹⁶ United Nations, *Multilateral Economic Co-operation in Latin America*, vol. I. New York, 1962 (United Nations publication, sales No.: 62.II.G.3), p. 23.

¹⁷ Costa Rica acceded to the Treaty with its signature in July 1962. However, the Treaty came into effect on 4 June 1961, upon ratification by the three Governments of Guatemala, El Salvador and Nicaragua.

¹⁸ *Multilateral Economic Co-operation in Latin America, op. cit.*, p. 8.

promotion of new productive activities, providing for periodic joint elaboration of the list of Central American manufactures to be granted special tariff protection in the area from the moment they supply at least 50 per cent of the regional demand. The two lists approved between 1963 and 1965 include certain glass products, electric bulbs, sanitary paper and sulphuric acid.

Intra-regional trade in the five Central American republics has increased greatly since 1960, although progress in industrial integration could have gone further but for the fact that the area integrated is a relatively small one, having a total population of a little over 12 million and an average population density of 27 persons/km²; moreover, it has still to build up a common basic economic infrastructure with respect to roads, harbour facilities and energy.

In Latin America, the Treaty Establishing a Free-Trade Area and Instituting the Latin American Free-Trade Association, or briefly the Treaty of Montevideo, was signed on 18 February 1960, by government representatives from seven countries—Argentina, Brazil, Chile, Mexico, Paraguay, Peru and Uruguay. Subsequently, before the end of 1961, Colombia and Ecuador also ratified the agreement. The Latin American Free Trade Association had thus nine members with a total population of about 180 million and a total area of 18.3 million km², giving an average population density of 10/km² in 1963.¹⁹

The Treaty of Montevideo, which became effective on 2 June 1961, established the Latin American Free Trade Association (LAFTA or ALALC) with headquarters in Montevideo. In the course of a period of twelve years, the participating countries agreed to eliminate all duties and other restrictions on "substantially all their reciprocal trade". In chapter III of the Treaty on "Expansion of Trade and Economic Complementarity", article 16, it is stated that "with a view to expediting the process of integration and complementarity . . . , the Contracting Parties: (a) shall endeavour to promote progressively closer co-ordination of the corresponding industrialization policies, and shall sponsor for this purpose agreements among representatives of the economic sectors concerned; and (b) may negotiate mutual agreements on complementarity by industrial sectors."²⁰ Little attempt, however, has been made to conclude industrial complementarity agreements. Up to early in 1965, only two had been signed. One, in force since July 1962, deals with calculating and other punch-card machines and has been acceded to by Argentina, Brazil, Chile and Uruguay. The second, concerning electronic valves, came into force in April 1964, and has been

signed by the same four countries and Mexico. The first agreement has already begun to have an effect on trade in the goods in question. Argentina has exported 354,000 US dollars' worth of calculating machines to Brazil and Uruguay. In addition, more investment has been made to develop new market opportunities.

The reasons for the slow progress in the conclusion of industrial complementarity agreements are not far to seek. According to a study by the ECLA secretariat,²¹ "a number of explanations are forthcoming for the scant use made of these agreements, including the unlimited application of the most-favoured-nation clause; the difficulties and inevitably slow tempo of any negotiations of this kind; the lack of specific multi-national projects in particular sectors; the want of an agency to study and promote such agreements; the incompatibility of industrialists' interests and those of their respective Governments; and lastly, the preference of those concerned for Common Schedules²² as a means of liberalizing trade in certain products." In regard to the first and most important difficulty—the unlimited application of the most-favoured-nation clause—an attempt has been made to remedy this situation in resolution 99(IV) adopted by the ALALC Conference, which stipulates that the benefits of a complementarity agreement shall not be extended to countries that have not adhered to it unless they have previously granted satisfactory compensation.

In the ECAFE region, industrial integration among developing nations has not yet begun, but has entered the stage of preliminary deliberation at several meetings of government representatives convened under the auspices of ECAFE. At the second session of the Conference of Asian Economic Planners in October 1964, it was felt that "the time had come to attempt the first steps towards regional harmonization of production plans in countries of the region . . . Such plan harmonization was regarded as necessary for accelerating the economic development of the region, because the expansion of intra-regional trade would call for the creation of new patterns of complementarity in the production structure of the national economies. It was not sufficient to seek a significant increase in trade flow along the traditional lines; economic co-operation to serve as an effective tool for the region's economic growth, should be extended to the field of production

²¹ "A Contribution to the Economic Integration Policy in Latin America" (E/CN.12/728, 20 April 1965), p. 46.

²² In addition to the national lists of tariff reductions to be achieved through annual negotiations by each country on imports from the rest of the group, equivalent to not less than 8 per cent of the weighted average duties applicable to third countries, a Common List is to be drawn up which will itemize the products on which all countries agree ultimately to eliminate duties. The Common List is to cover products accounting for 25 per cent of trade among the participants by the end of the first three-year period, 50 per cent by the end of the second, 75 per cent by the end of the third, and "substantially all of such trade" by the end of the fourth.

¹⁹ The four most populous countries have 151 million people or 84 per cent of the total, namely, Brazil (76 million), Mexico (38 million), Argentina (22 million) and Colombia (15 million).

²⁰ *Multilateral Economic Co-operation in Latin America, op. cit.*, p. 58.

and investment planning. The guiding principle should therefore be intraregional and international specialization in production on the basis of mutual agreement, of a kind that would assure mutual benefits and equity to all participating countries.²³

In the following year, in December 1965, the Asian Conference on Industrialization resolved to set up an Asian Industrial Development Council, whose functions would be, *inter alia*, "(1) to keep in continuous review industrial development plans, programmes and policies adopted in the regional member and associate member countries with a view to achieving progressive harmonization of industrial development plans, and (2) to identify projects where the co-operation of two or more countries is required for the pooling of markets to achieve economies of scale, international division of labour and for the better utilization of raw materials; and to recommend ways and means for the investigation and implementation of such projects."²⁴

ECAFE, at its twenty-second session in March/April 1966, adopted resolution 68(XXII) on the Asian Conference on Industrialization and Asian Industrial Development Council, whereby the Conference was made a permanent organ of the Commission, to meet with the joint participation of ECAFE and UNIDO and, at three-yearly intervals, to review and advise upon progress made with all the problems involved in industrialization in the ECAFE region; and the Asian Industrial Development Council was required to meet at least once a year, to perform the functions mentioned above.²⁵

At its first session in September 1966, AIDC felt that, in selecting multi-national industrial projects, first and foremost were the willingness and ability of the countries concerned to join together in a co-operative endeavour. That being assured, it appeared that projects which would have the greatest impact on the improvement in productivity of the agricultural sector and in the utilization of forest products deserved the highest priority. From this point onward, many steps would have to be gone through before projects could be implemented; these included preliminary economic studies to establish viability in the context of the economic and commercial situation in regard to the product vis-à-vis the region and the world, detailed techno-economic studies, detailed engineering reports, financing and so on. Another factor to be considered was that, whereas in certain industries, such as integrated iron- and steel-making plants, economies of scale and technological factors would not permit the slow building up of the different parts of the industry,

in certain other industries, such as forest products industries, implementation, stage by stage, namely, logging followed by timber production, followed by production of laminated products, pulp, etc., would be developed over a period of years.

On the basis of the above-mentioned considerations, the Council selected a number of industrial projects for which the co-operation of two or more countries would be required, in various fields, namely, forest products, fertilizers based on natural gas, alumina, silica industries, integrated iron- and steel-plants, engineering industries including manufacture of agricultural machinery, mineral based industries, and methanol.²⁶

It may also be noted that RCD, established by Iran, Pakistan and Turkey in July 1964, has worked out three large industrial projects, for aluminium, carbon black and bank-note paper, which have been approved in principle for implementation on a joint equity participation and production sharing basis. Studies on a number of industries such as locomotives and pulp and paper, which have been identified as suitable for development on a joint basis, have been completed and are being examined by expert groups. Detailed studies are nearing completion on other groups of heavy industries, including diesel engines, shipbuilding, electrical goods, textile machinery, tractor components, machinery and equipment for the tea industry, plant and equipment for chemical, sugar and cement factories.²⁷

IV. The prerequisites for industrial integration

Any experiment for industrial integration between two or more nations, to be successful, appears to call for the presence of at least three preconditions or prerequisites, namely, an integrated market under a free trade regime or common market arrangements, similarity in stages of development, and availability of infrastructural facilities for regional or sub-regional industrialization.

An integrated market for two or more participating countries, which can absorb the products of an industrial plant operating profitably with a minimum capacity, is essential to any scheme for industrial integration. This has been the case with the industrial integration schemes already reviewed, whether in western Europe, East Africa, Central America or Latin America. Asia lags behind in this regard, but a promising beginning in the direction of establishing a free trade regime appears to have been made by ASA. In October 1966, a communique issued after the final

²³ Annual Report of ECAFE, 1964/65 (E/CN.11/705), para. 344.

²⁴ Proceedings of the Asian Conference on Industrialization (E/CN.11/719, 10 January 1966), p. 115.

²⁵ Annual Report of ECAFE, 1965/66 (E/CN.11/739/Rev.1), pp. 184-188.

²⁶ ECAFE, "Report of the First Session of the Asian Industrial Development Council" (E/CN.11/747, 21 September 1966), part III.

²⁷ ECAFE, "Sub-regional Plan Harmonization: A Case Study of the Regional Co-operation for Development" (RP/WPH.I B.3, 11 November 1966), p. 20.

session in Kuala Lumpur of a joint ASA committee on trade liberalization stated that the committee "discussed the possibility of establishing a Free Trade Area among the ASA countries", which include Malaysia, Philippines and Thailand.²⁸

A second prerequisite is similarity in the stages of development reached by countries participating in the industrial integration scheme. The failure of the industrial integration experiment in East Africa is to be attributed largely to the more advanced stage of development in Kenya than in the other two states; as a result, economic development—industry, trade, finance, and economic growth—is concentrated in Kenya. Thus, for example, the Raisman Commission estimated that, from 1952-54 to 1957-59, real income per capita rose perhaps as much as 40 per cent in Kenya, and by rather less than half this amount in Tanganyika;²⁹ while in Uganda average incomes were just about maintained in real terms over the period. Thus inequality in income distribution between the three countries has been growing rapidly largely because new manufacturing, construction, public utilities, and other service industries have tended to gravitate to the more developed and urbanized areas of Kenya, notably around Nairobi and Mombasa. Also, it must be recognized that Tanganyika and Uganda, by paying higher prices for imports of manufactures from Kenya than they would have paid had they bought them from western Europe, have in effect been subsidizing Kenya's industries. In return, of course, Kenya pays protected prices for industrial products from the other two countries, but the balance of advantage is heavily in Kenya's favour because of the much larger share of manufactures in its exports. Furthermore, in these circumstances, there has been a large net outflow of capital from Uganda, equivalent to 5 per cent or more of domestic money incomes, for investment in both Kenya and elsewhere.³⁰ Finally, this lop-sided development has had an unfavourable impact on the financial resources available to the Governments for development expenditure. The effect of industrial growth in Kenya has been that all three countries have lost customs revenue from the displaced imports. Against this must be placed the effect of rising incomes in increasing the yield from income tax and excise duties as well as from customs duties on products continuing to be imported. But since the higher incomes have been generated primarily in Kenya, the result on

balance has been a seriously adverse effect on government revenue in Tanganyika and Uganda.³¹

A third prerequisite is the provision of regional infrastructure for industrial development and integration. It is true that, in Central America, efforts were made in the beginning to provide certain essential facilities on a regional basis, including the establishment of the Advanced School of Public Administration (ESAPAC, 1954), the Central American Research Institute for Industry (ICAITI, 1956), and the Central American Bank for Economic Integration (1961). This, however, is not adequate in view of the wide disparities in basic capital resources and the fund of technical knowledge and savings, as well as in roads and electric power plants, and the lack of links between these facilities at the regional level. The slow progress made in industrial integration is evidenced by the fact, already cited, that by 1965 only a few integration industries had emerged since the signing in 1958 of the Agreement on the Regime for Central American Integration Industries, these being the tyre and inner-tube plant in Guatemala, the caustic soda and chlorinated insecticide plants in Nicaragua, and the sheet-glass plant in Honduras. The ECLA secretariat, in a review of the "general situation and future outlook of the Central American Integration Programme, in January 1963, drew attention to the importance of establishing adequate regional infrastructure by stating that "the progress made towards the common market will tend to liberate forces that must increasingly lead, not merely to a customs union, but, in the longer run, to the economic union of the member countries. This union will have been fully achieved when, in addition to the features that already exist, there is a common basic economic structure with respect to roads, harbour facilities and energy, and when mobility of the factors of production has been achieved."³²

V. The problems of industrial integration

Industrial integration among developing nations has taken different forms in various parts of the world—industrial licensing in East Africa, designation of integration industries for the region in Central America, and inter-governmental industrial complementarity agreements in Latin America. Whatever be the forms or methods chosen for the purpose of achieving the objective of industrial integration, there are certain common problems which have arisen in the course of industrial integration. These include the choice of industries for integration, equitable distribution of benefits, regional investment policy, regional institutional structure, and industrial complementarity agreements.

³⁰ Dell, *op. cit.*, pp. 235-237.

³¹ *Ibid.*, p. 238.

³² ECLA, "Report of the Central American Economic Co-operation Committee, 13 December—29 January 1963" (E/CN.12/672), annex C, p. 31.

²⁸ *Bangkok Post*, 21 October 1966, "ASA Moves Toward Free Trade Area".

²⁹ In the United Republic of Tanzania (Tanganyika and Zanzibar) with a total population in 1964 of 10.3 million in a total area of 940,000 square kilometres, Tanganyika has a population of 9,990,000 or 97 per cent, and an area of 937,000 square kilometres or over 99 per cent. In contrast, Kenya has a population in 1964 of 9,104,000 with an area of 583,000 square kilometres, and Uganda a population of 7,367,000 and an area of 236,000 square kilometres. The average density of population per square kilometres is 11 in Tanganyika, 16 in Kenya, 31 in Uganda, and 127 in Zanzibar. The *per capita* national income in 1964 is \$85 in Kenya, \$77 in Uganda, and \$72 in Tanganyika.

Choice of industries for integration. In the selection of industries for integration among developing nations, it is important to keep in view the objectives for regional industrial integration schemes. These have been eloquently formulated, for instance, by Placido Carcia Reynoso, Mexico's Deputy Minister of Industry and Commerce and Chairman of the Governing Board of the Latin American Economic and Social Planning Institute in the following terms:³³

1. To facilitate the gradual adaptation of existing industries to the conditions and dimensions of a regional market, without exposing them to the excessive risks of competition from other firms, already in operation or new, that may be attracted to the region by the changed circumstances of production and distribution and by the appeal of a market enhanced by a preferential customs regime.

2. Through progressive specialization on a national and regional scale, and also within each industrial branch, to extend the import-substitution process to sectors that are technologically more complex, require a higher initial investment, and are more advantageous from the standpoint of productivity and efficiency than those at present operating in the individual domestic markets.

3. To create favourable conditions so that existing firms, as well as those expressly established for exporting manufactured goods to third countries, will be equipped to compete with those operating in world industrial centres.

However, in view of the scarcity of investment resources and of the pressing need to accelerate the rate of growth, the developing countries should, in attempting to achieve the above objectives, also stress the need of channelling the resources towards those sectors which have a key importance for the development process. Among these sectors may be mentioned iron and steel, chemicals (including petro-chemicals, fertilizers and other heavy chemicals), pulp and paper, heavy equipment, fuels, energy and infrastructure in general. The demand for the products of strategic industries expands very rapidly, and as long as they are not produced in the country, they are imported in large quantities and contribute to the tightening of the external bottleneck. In other words, their usually high income elasticity of demand contrasts with the usually low income elasticity of the traditional export commodities of the developing countries. The establishment of these activities in developing countries would make a particularly important contribution toward redressing the external imbalance. These activities, moreover, usually powerfully induce growth. It

is therefore clearly in the public interest that investment resources should be directed to these branches.³⁴

In Central America, article II of the Agreement on the Regime for Central American Integration Industries stipulates that "the Contracting States shall regard as Central American integration industries those industries which, in the judgment of the Central American Industrial Integration Commission, comprise one or more plants which require access to the Central American market in order to operate under reasonably economic and competitive conditions even at minimum capacity."³⁵ The products of plants which form part of a Central American integration industry and which are covered by the present Regime enjoy the benefits of free trade between the territories of the Contracting States, while the products of plants which form part of the same industry but which are not covered by the industry but which are not covered by the Regime, enjoy in the Contracting States successive annual reductions of 10 per cent in the applicable uniform Central American tariff. Also, the enterprises owning industrial plants covered by the present Regime enjoy, in the territory of the countries where such plants are or may be established, in the way of fiscal incentives, the benefits and exemptions prescribed by the national legislation of the country concerned. Finally, except in cases of emergency, the Governments of the Contracting States shall not grant customs duty exemptions or reductions below the Central American common tariff on any imports from countries outside Central America of goods which are equal or similar to or substitutes for goods manufactured in any of the Central American countries by plants of industrial integration industries, nor shall they apply to such imports preferential exchange rates equivalent to such exemptions or reductions.

*Equitable distribution of benefits.*³⁶ In the course of industrial integration, the most difficult problem is the equitable distribution of gains among countries that are at different stages of development, with some developing countries being more or less developed than others. The elimination of trade barriers among these countries will often lead to the concentration of investment in the more advanced developing country, because of the presence in the latter of economic and social infrastructure and higher returns on capital. The less advanced developing country, because of trade liberalization, will not only lose customs revenue on imports from the more advanced developing country, but may sometimes have to pay a higher price for these imports

³⁴ UNCTAD, "Trade Expansion and Economic Integration among Developing Countries" (TD. B/85, 2 August 1966), para. 72.

³⁵ United Nations, *Multilateral Economic Co-operation in Latin America*, vol. I on "Text and Documents" (United Nations publication, Sales No.: 62.II.G.3), 1962, p. 23.

³⁶ For a fuller discussion of this subject, see UNCTAD, "Trade Expansion and Economic Integration among Developing Countries, *op. cit.*", pp. 36-64.

³³ "Problems of Regional Industrialization", in Miguel S. Wionczek (ed.), *Latin American Economic Integration: Experiences and Prospects*, Frederick A. Praeger, London, 1966, pp. 159 and 160.

than for those from a third country. Under these circumstances, further polarization of development in an area where countries are at a disparate stage of development may result, as has happened with the East African Common Market referred to above.

In order to achieve equitable distribution of benefits among a group of nations at disparate stages of development in any scheme for industrial integration, it is necessary to narrow the gap between the more advanced and the less advanced developing country. Otherwise, the less advanced developing country may fear a flight of capital as well as an exodus of qualified labour to the more advanced country. It must be assured of a fair sharing of the gains from a regional market, as well as of the advantages which accrue to regional industrial integration arising from the economies of scale.

In Central America, the Transitional Article in the Agreement on the Regime for Central American Integration Industries, signed on 10 June 1958, stipulates that "in order to promote an equitable distribution of the Central American industrial integration plants, the Contracting States shall not award a second plant to any one country until all of the five Central American countries have each been assigned a plant". However, in actual practice, this principle has not proved to be workable. When, late in 1961, informal negotiations on the implementation of the Regime started at the first meeting of the *ad hoc* Working Group on Industrial Development, held in Managua, Nicaragua, the politics of the distribution of the integration industries and not its economics became the main issue. Virtually no use was made of the existing ECLA industrial studies to relate individual projects to the needs of the region, except in a sense that each project obviously needed access to the whole regional market. Little attention was given to the economics of location. Also, the least developed countries would insist on the principle of negotiations by "rounds", whereby each country would receive a similar number of projects. Indeed, "for any one cognizant of these first discussions of the implementation of the Regime of Integration Industries it became quite obvious that the economics of industrial integration were closely intertwined with the politics of economic co-operation and that any attempt to divorce them might put heavy strain on the orderly functioning of the Central American common market scheme."³⁷

A number of measures in the field of fiscal incentives, improvement of infrastructure, and establishment of a regional financing agency have been suggested to achieve an equitable distribution of benefits among the participating countries in an industrial integration scheme.

A useful illustration of fiscal incentives is provided by the Central American Agreement on Fiscal Incentives to Industrial Development, signed on 31 July 1962 by the five republics. In the first place, the enterprises qualified to avail themselves of these incentives are defined as those "having industrial plants which, by the use of modern and efficient manufacturing methods for the processing of raw materials and semi-finished goods, produce articles that are necessary for the development of other productive activities or for meeting the basic needs of the population, that replace articles imported on a substantial scale or that increase the volume of exports." These enterprises are classified into three groups, A, B, or C, according to their importance to the national economy, the extent of local materials consumed, and their contribution to the improvement of the payments position. An industrial enterprise in group A or B shall be classified as a new or existing industry. The benefits to be granted cover: (1) total or partial exemption from customs duties and related charges, (2) exemption, for the enterprise and its members, from income and profits taxes on earnings from the qualifying activities, and (3) exemption from taxes payable on assets and net worth by the enterprise or by its owners or shareholders in respect of the qualifying activities. These benefits vary according to whether the enterprise falls into group A, B, or C, or whether it is a new or existing industry; also, the extent of exemption is greater for machinery and equipment, less for raw materials, semi-manufactured goods and containers; and least for fuels.³⁸

Fiscal exemption or tax incentive could attract investors if they are granted automatically and not subject to involved negotiations. Also, while it is easy for a well-to-do country to grant these incentives, it would be difficult for a poorer country to deprive itself of necessary revenue.

However, the inconveniences which result for enterprises from serious infrastructural insufficiencies in certain areas cannot be compensated by fiscal incentives; and, if an enterprise sees no chance of making a profit, fiscal incentives must evidently remain ineffectual. Nor are long periods of fiscal exemption likely to sway an investor's decision in cases where there are possibilities of basic political changes in the countries concerned. In general, it would therefore appear that more immediately tangible measures, such as the availability of free or low-rent industrial estates or premises and the granting of substantial financial starting aids—in the form of low-interest loans of long maturity, of equipment bonuses equivalent to a certain percentage of the investment, or of straight subsidies—would be more likely to influence investment decisions.

³⁷ Wionczek, *op. cit.*, pp. 8-9.

³⁸ ECLA document, E, CN.12/672, *op. cit.*, annex D, pp. 56-62.

Another type of measure is the improvement in the less advanced developing countries of their infrastructure, including transport, telecommunication, energy supply and human investments such as education, health and even housing. These infrastructural investments require large financial resources which are clearly beyond the possibilities of a less advanced developing country. They can, however, be constructed with less cost if undertaken on a regional basis. It is therefore desirable to entrust an important responsibility in this respect to a regional financing agency, such as the Inter-American Bank for Latin American, the Central American Bank for Economic Integration, the African Development Bank or the Asian Development Bank. Indeed, as provided for in the Agreement Establishing the Asian Development Bank, one of its functions is "to utilize the resources at its disposal for financing development of the developing member countries in the region, giving priority to those regional, sub-regional as well as national projects and programmes which will contribute most effectively to the harmonious economic growth of the region as a whole, and having special regard to the needs of the smaller or less developed member countries in the region." (Article 2.)

*Regional investment policy.*³⁹ When two or more nations join hands in the establishment of an industry or industries sensitive to the economies of scale, and share an integrated market, the question arises as to the most advantageous or rational allocation of industries among the participating countries after careful consideration of a variety of relevant factors. In thus trying to establish a regional investment policy, the motives prompting it would be equitable distribution of benefits, establishment of priorities through concentration on key industries for development purposes, avoidance of duplication to eliminate excess capacity giving rise to wasteful competition, and strengthening of domestic enterprises through participation of both domestic and foreign capital. The difficulties in the establishment of such a policy are, however, enormous. In agreeing upon the location of industries, one must be aware of the fact that, even in a co-operative or joint industrial venture among several nations, each country is sovereign; that a certain industry may be suitably located in more than one country; that each country has a bias in favour of producing goods at home since external factors often escape control; and that, in joint planning for a regional investment policy, each country will have to be ready to make certain sacrifices in order to achieve common ends.

In order to facilitate inter-governmental agreements on a regional investment policy, it is important to plan jointly, through the establishment of a planning

co-ordination committee or a regional development board which can meet to exchange views on the industries to be established under the national plans, and agree on an allocation of industries which could be best undertaken by individual countries from a regional viewpoint. It would be more flexible if such an exchange of views were to take place before the national plan was finalized, so that any adjustment required from a regional viewpoint could still be made.

In view of the difficulties in agreeing upon a regional investment policy, it would be highly desirable to delimit the scope of regional industrial planning from the start. Thus, regional industries may preferably be limited to: (1) those specific industrial projects representing new investment in the regional market, (2) industries requiring access to the regional market for efficient operation, (3) industries requiring large capital which can be provided by the state instead of by a large number of private investors, thus facilitating decision-taking by confining it to one single body, (4) sectors having great strategic importance for the development process, and (5) a "package" of industrial projects covering either various projects or various sectors within which there would be possibilities for giving satisfaction to each participating country.

In channelling investments into the desired locations and to avoid duplication of investment, there should be no national licensing of the plants that have not been agreed upon by the governments concerned. Instead, the regional group should issue a common license covering the branches in question. While a unanimous decision on this question might encounter the danger of a veto by a partner country, and a majority decision might give rise to fears of inequity, it seems that the decision on a common license would require considerable confidence among the partners. Secondly, if only agreed plants had free access to the whole regional market, there would be a strong incentive for investments to go to the desired location. Thirdly, the governments might agree that each country would grant incentives (such as fiscal incentives, state aid, credits, or technical assistance) only to projects which had been agreed upon or which were consistent with the criteria established in a regional investment policy. Fourthly, the effectiveness of any of the means so far discussed could be enhanced if a regional financing institution were to declare that it would actively promote those projects that were consistent with an agreed policy, say, by means of a guarantee for private loans granted to these projects. Fifthly, the attitude of international financing institutions, such as the World Bank, the International Finance Corporation or the International Development Association, could be very influential in helping regional investment policies, including agreements on the allocation of specific industries. These institutions could commit

³⁹ For a fuller discussion on the subject, see UNCTAD document TD/B/85, *op. cit.*, pp. 65-93.

themselves to giving priority to the financing of projects provided for in such agreements; they might even take a policy decision to seek out such opportunities systematically in the future, not only in the field of infrastructure, but also of industry. Finally, in order to avoid duplicating investments in the countries of an existing or potential regional group, countries might agree to consult in advance before any of them authorized an investment in a production line that existed already in another country of the group or was contemplated in that country's development plan.

To take advantage of the economies of scale and to avoid duplication, a regional investment policy may aim at the establishment, in a particular regional market, of only one plant engaged in a particular line of production. The smaller the area to be integrated, the more numerous would be the cases of industries for which only one plant would be justified. In such a situation, the approved plant might in fact or in law be regarded as having the benefit of a monopoly. As a precaution against abuse of this situation, provision might be made for the supervision of the firm concerned or for fixed norms as to the prices, quantity and quality of the goods it was to produce. A number of other means might also be employed. First, the period during which the approved firm was to have access to the regional market during which no other firm might be licensed might be limited to a few years. Secondly, where import substitution aimed only at supplying a high percentage, not the whole, of total demand, the deficit might be filled by imports from third countries by a lowering of the external tariff, thus exerting some pressure upon the privileged producer. Thirdly, before temporary exclusive privileges were to be granted to a particular enterprise, public solicitation of investment offers might help to ensure fair play in the decision-making process.

Foreign capital would be needed for regional investment projects for several reasons. First, such capital is necessary for closing the trade gap which is largely related to the import demand for capital goods in the course of development. Secondly, owing to population growth and demonstration effects, domestic savings as limited and insufficient for carrying out a high rate of investment. Thirdly, foreign capital can ensure a stream of modern industrial technology into the developing countries. Foreign capital, however, will not flow to countries whose policies towards foreign investment are changing and uncertain and do not guarantee either profitable or secure returns. To favour positive contributions by foreign capital, various instruments can be envisaged. First, the countries wishing to integrate should harmonize their approach to foreign investments or establish a regional investment code. Criteria regarding a minimum of local capital participation or the exclusion of foreigners from ownership in certain sectors, the rules regarding the

transfers of profits, interests, royalties and technical assistance fees, the privileges with respect to taxes and duty-free imports, the valuation of assets of enterprises for fiscal purposes, the guarantees for the security of investments, local participation in management, etc., would then be defined at the regional level. A regional convention on commercial arbitration would usefully supplement such rules. Secondly, partnerships between foreign and domestic investors should be systematically promoted. From the viewpoint of the foreign investor, a number of advantages would accrue to such partnerships, such as the knowledge of the domestic market which nationals possess, the easing of the relations with the government or the desire to reduce the risks of political discrimination. On the other hand, the domestic investor would benefit from the inflow of technology and skill, and enjoy the training opportunities, the credit facilities and the technical assistance which the foreign investors could provide in a joint partnership.

Regional institutional set-up. For the purpose of implementing regional industrial integration, within the framework of a free trade regime (as in the case of the Latin American Free Trade Association) or a common market (the Central American Integration Industries Regime), regional institutions to implement decisions already reached or to initiate the conclusion of new agreements are essential. Such institutions are all the more important in developing countries, where market forces do not operate automatically or with as much effect as in developed countries.

In Central America, a supreme body having the power to conclude agreements for the establishment of a regional integration industry does not exist, for "the application of the present Regime to the Central American integration industries is subject to signature by the Contracting States, in respect of each of the said industries, of an additional protocol.⁴⁰" The absence of such a body having the power to conclude agreements necessarily delays the whole process of setting in motion an integration industry. The Agreement Establishing the Regime for Integration Industries provides, however, for the establishment of a Central American Industrial Integration Commission in order to ensure due application of this Agreement and of the additional protocols. In 1960, when the General Treaty on Central American Economic Integration was concluded, it incorporated the Agreement on the Regime for Central American Integration Industries. Under this agreement has been established the Central American Economic Council, composed of the Ministers of Economic Affairs of the several Contracting Parties, for the purpose of integrating the Central

⁴⁰ Article III of the Agreement on the Regime for Central American Integration Industries (Tegucigalpa, 10 June 1958), in United Nations, *Multilateral Economic Co-operation in Latin America* (United Nations publication, sales No.: 62.II.G.3), 1962, pp. 23-24.

American economies and co-ordinating the economic policy of the Contracting States. This is the policy-making body, under which is set up an Executive Council, consisting of one titular official and one alternate appointed by each Contracting Party, for the purpose of applying and administering the present Treaty and of undertaking all the negotiations and work designed to give practical effect to the Central American economic union. The Executive Council assumes on behalf of the Contracting Parties, the functions assigned to the Central American Industrial Integration Commission, as well as many other powers. In addition, a permanent secretariat has been instituted to act as such for both the Central American Economic Council and the Executive Council, and to see that this Treaty and all other agreements relating to Central American economic integration already signed or that may be signed hereafter are properly executed among the Contracting Parties.

In case of the Latin American Free Trade Association (ALALC) established since 1960, the organs are the Conference of the Contracting Parties and the Standing Executive Committee. The Conference is the supreme organ which adopts all decisions in matters requiring joint action on the part of the Contracting Parties. It is composed of duly accredited representatives of the Contracting Parties, and holds a regular session once a year and special sessions when convened by the Committee. The Committee is the permanent organ of the Association responsible for supervising the implementation of the provisions of the Treaty Establishing a Free-Trade Area and Instituting the Latin American Free-Trade Association. It consists of a permanent representative of each Contracting Party, who shall have an alternate. The Committee shall have a secretariat headed by an Executive Secretary and comprising technical and administrative personnel.

The ECLA secretariat reports that "what is proposed is not a political integration but the establishment of community institutions that are more independent, and have more freedom and scope for action, than the existing ALALC organs, but would at the same time have the same Latin American character as those organs, without prejudice to any co-operation that might be received from inter-American or international institution.⁴¹ At the first stage of integration, the community institutions should fulfil practical purposes, including: (1) objective evaluation before establishing the mode for the application of new agreements, (2) formulation and study of new agreements from the standpoint of the interests of the community for consideration by the governments concerned, (3) establishment of agencies to promote and encourage

actively, and on a continuing basis, the full and prompt exploitation of the new trade and development opportunities provided by the agreements signed, and (4) a high-level organ to adopt decisions relating to the execution of the agreements concluded and propose amendments to the governments. To fulfil these functions, the ECLA secretariat proposes the following community organs: The Council, the Board, an agency to promote investment, a committee of entrepreneurs and workers, the parliamentary assembly, and *ad hoc* arbitration tribunals.

The Latin American community should have a high-level political organ, the Council, which would be responsible for taking the decisions required for the progress of integration. It would be a ministerial organ, consisting of the Ministers for Foreign Affairs of all member countries, who could be accompanied, and in some cases replaced, by other Ministers with jurisdiction over any special questions that might come up. It would meet at least twice a year, to exercise the basic powers in relation to the integration process, particularly in regard to tariff reduction, regional investment policy and other matters requiring generally a unanimous decision.

The Board, which is to be the prime mover of integration, should have powers to make studies and propose action with complete freedom from any kind of limitation. The Board, whose members would be elected by the Council, would essentially represent the interests of the community. Though it would not be a supranational authority, since it would not impose any new obligations on the Contracting Parties, it would adopt a supranational approach in expressing the interests of the community. The members of the Board would be elected from persons of high reputation in Latin America, for specific periods, but could be re-elected for one or more additional periods. The Board would have (1) a supervisory function of watching over the faithful and strict fulfilment of the agreements concluded and of decisions adopted by the Council and the tribunal, (2) a dynamic function of proposing projects, programmes or provisions to the Council, and formulating any recommendations it deemed desirable for the better fulfilment of the agreements and for the conclusion of new agreements, particularly in relation to a regional investment policy, trade and tariff policies, etc., (3) a promotional function of furthering economic development within the framework of the regional investment policy, including the encouragement of sectoral complementarity agreements and projects for the establishment of new industries as a joint operation by several countries, (4) a co-ordinating function, by virtue of which the Board would act as a link between national agencies for the planning and promotion of development, and would facilitate and encourage the consideration, and promote the complementarity, of projects of common interest

⁴¹ ECLA, A contribution to economic integration policy in Latin America (E/CN.12/728. 20 April 1965), chapter X on "The Institutional Structure", p. 172.

to several countries, (5) an evaluating function, in determining and considering the facts on which were based requests for exemption from the general rules in force, and in making recommendations on how such requests should be dealt with, and (6) a conciliatory function, in relation to disputes that might arise from the application of the agreements, through the recommendation of solutions.

The investment promotion agency, to be established by an agreement between the Board and the Inter-American Development Bank (IDB), would be directed and administered by a Governing Council on which the Board and the IDB would be represented, and to which only nationals of member countries of the Latin American economic community would be appointed. The agency would carry out the regional investment policy by translating it into specific projects, with the assistance of technical advisers and the co-operation of other institutions such as ECLA, the Latin American Institute for Economic and Social Planning, etc. The agency would act specifically in relation to the following:

- (a) The preparation of draft projects of sectoral agreements;
- (b) The advising of countries and of the Board in the negotiation of such agreements;
- (c) The execution of particular aspects of sectoral agreements, when the Board so requested, in particular those relating to technical assistance;
- (d) Advice to the Board to ensure the correct functioning of the sectoral agreements and the fulfilment of the obligations they involved.

The committee of entrepreneurs and workers, an advisory body to meet twice a year, would, in co-operation with the Board, assist in clarifying and defining of a given number of representatives of the entrepreneurs and workers of each of the Contracting Parties, and its members would be appointed by the various Governments for a given period, and could be re-elected.

The parliamentary assembly would consist of representatives of the Congresses of each of the member countries; it would permit the establishment of a group of persons who would act in their respective national parliaments on the basis of a direct and detailed knowledge of integration problems.

The *ad hoc* arbitration tribunal would be established whenever there was a complaint relating to non-compliance by one of the Parties with agreements or obligations entered into under the Treaty, or other instruments arising from the Treaty. In each case the tribunal would consist of members of different

nations appointed by lot from a five-member panel submitted by each country. The tribunal could also serve as the legal advisory body to the other community institutions.

Industrial complementarity agreements. In Latin America, these agreements are provided for in articles 15-17 of the 1960 Montevideo Treaty establishing the Latin American Free Trade Association. Each agreement should include a specific liberalization programme and rules for maintaining the preference margins agreed on vis-à-vis third countries, as well as provisions designed to reconcile the treatments accorded to imports from third countries, to co-ordinate government programmes and incentives (including those relating to the treatment accorded to capital and services from inside and outside the area) and to establish regulations for the prevention of unfair trade practices. To date, only two complementarity agreements have been negotiated and ratified, in connexion with certain types of calculating-machine and with electronic valves. The limited use made of these agreements is, as noted earlier, due to the length of time required for complicated negotiations of this kind, the lack of multinational projects in particular sectors, the want of an agency to study and promote such agreements, the incompatibility of industrialists' interests and those of their respective government, and the preference of those concerned for Common Schedules as a means of liberalizing trade in certain products. The ECLA secretariat has also pointed out as further explanations the failure of the Montevideo Treaty to include promotional provisions and necessary machinery to implement specific provisions for the promotion of a given industry, particularly in regard to supervision of the fulfilment of commitments and to the execution of investment and technical assistance programmes designed to promote new production activities or to facilitate the adaptation of those already existing.⁴² In order to get out of these difficulties, ALALC, by virtue of resolution 31 of the Standing Executive Committee, established the Advisory Committee on Industrial Development (Comision Asesora de Desarrollo Industrial—CADI), to make a study of the Contracting Parties' industrial policies and to define the problems affecting the integration of industry. CADI's first meeting, held in May 1964, had two particularly important results: it approved a number of bases for the formulation of the area's industrial development policy, and recommended to the Standing Executive Committee that four study groups be set up, three of which would be concerned with the elucidation of integration problems in specific branches of industry.

The bases for the formulation of an industrial development policy applicable in the area, including (1) the concept of "the programmed location of industries of importance for the Area" "in view of the

⁴² *Ibid.*, pp. 123-24.

different structures and levels of development in the ALALC countries”, (2) the aim of “an equitable distribution of the benefits deriving from integration” for such a programming, and (3) the inclusion not only of trade policy but also of “all others capable of influencing a process of industrial integration by sectors” among the devices and incentives to be used in the programming of integration, represent a conceptual advance with respect to those on which complementarity agreements have thus far been established, and constitute the first enunciation of an integration policy. However, like the complementarity agreements, the bases formulated by CADI for a region-wide form of sectoral programming, ambitious as they may be in many respects, will also be subject to the limitation that they are conceived for new production lines and as a means of reconciling the advance of integration with protection of the position reached by each country’s existing industries.

The study groups were to be composed of technical experts from the ALALC secretariat and from inter-American economic co-operation agencies (ECLA, Inter-American Economic and Social Council, and Inter-American Development Bank), in addition to experts designated by the Governments of ALALC member countries by way of technical co-operation rather than official participation. Three of these groups were to be concerned with problems affecting steelmaking, the petro-chemical industries, and the pulps and paper industry, respectively. As pointed out by the ALALC secretariat in a report presented at the second meeting of CADI in 1965, the experience of the international agencies engaged in making descriptive studies of sectors of industry in ALALC countries shows that, given several experts working exclusively on one sector, and the funds required for visits to the countries concerned, the work takes about three years.

Since the first meeting of CADI, the Conference of the Contracting Parties of ALALC had adopted two important resolutions. The first, resolution 99(IV), opened up fresh possibilities for sub-regional arrangements, by admitting exceptions to the application of the most-favoured-nation clause. The Montevideo Treaty, it may be noted, did not afford scope for sub-regional agreements, and precisely the likeliest possibilities of complementarity, in a restricted sense, seemed to exist in smaller groups of countries, often being of interest to a single concern established in the countries in question. Under the terms of article XXI of resolution 99(IV), the Contracting Parties expressly agree that those of them which are not parties to a complementarity agreement shall only benefit by the reciprocal concessions agreed on between its signatories, subject to the granting of fair compensation.⁴³ The second

⁴³ It is up to the Standing Executive Committee of ALALC to settle any differences of opinion likely to arise in the course of negotiation as to what is meant by “fair compensation”.

resolution, resolution 100(IV), is to formulate, in broad terms and in the light of past experience, the basic guide-lines for economic policy in relation to customs, monetary, agricultural and industrial development questions, as well as to draw up a programme of action for the implementation of such policies. The guide-lines for industrial development policy, which embody all the criteria proposed by CADI, place strong emphasis on industrial integration through the joint programming of sectors of industry and the use of instruments other than complementarity agreements; but, at the same time, a distinction is still drawn between new and existing activities, joint programming being regarded as acceptable only for the new branches of industry. The ECLA secretariat questions the advisability of reserving the sectoral programming approach on a region-wide basis to the new and dynamic sectors. “Such a step”, it feels, “might result in a tendency to sanction the unprogressiveness and virtual technological stagnation now prevalent in many of Latin America’s traditional industries. Instead of respecting and even accentuating the disparities in productivity and operational efficiency between the new and the traditional sectors, industrial integration ought to aim expressly at eliminating them little by little, extending to the whole of the manufacturing sector the benefits of competition as an instrument for promoting efficiency and technological progress, and using sectoral programming as an effective means of gradually and systematically modernizing the traditional industries, as well as of promoting substitution of the new sectors’ production for imports from outside the region.⁴⁴” The ECLA secretariat also raises the question “whether an agreement relating to a sector of industry and representing a genuine sectoral and regional development programme, in which recourse would be had to the whole range of indispensable non-tariff instruments, could be implemented and supervised through the existing institutional machinery.” It is precisely on account of this institutional deficiency in ALALC that ECLA secretariat advances the proposals regarding institutional reorganization of ALALC noted earlier, including the establishment of a regional investment promotion agency.

The main feature of a sectoral agreement would be its adaptation to the specific conditions and difficulties of a particular branch of industry and, in this respect, there could not be two identical sectoral agreements. None the less, they must all have the same structure. According to the ECLA secretariat, the principal characteristics of a model sectoral agreement would be:⁴⁵

(i) A development programme for the sector throughout the region, designed to indicate the framework for the evaluation of trade development and

⁴⁴ ECLA, document E/CN.12/728, *op. cit.*, p. 129.

⁴⁵ *Ibid.*, pp. 138-140.

industry location trends, investment needs, etc., in successive years, and to constitute a diagnosis of the outstandingly weak points of the industry considered;

(ii) An investment programme, i.e. an estimate of the investment needs if the branch of industry is to grow in line with the assumption of the proposed sample programme,⁴⁶ and also of that required to eradicate or correct the weaknesses of certain countries or enterprises as regards intraregional competition, according to the diagnosis of the industry prepared and included in the development programme;

(iii) A technical assistance programme parallel with the investment programme, aimed at helping the competitors that are likely to suffer most when intraregional competition is intensified, and describing the procedures, areas of application and manpower and financial resources needed;

(iv) A programme for the reduction of internal customs duties over and above the targets established in the general formula, as consistent with the specific conditions obtaining in the industry itself; and procedures for applying the safeguard clause in case of maladjustments in existing concerns, adapted to the particular conditions of the industry in question (for example, liberalization by means of quotas as applied to a growing proportion of the market);

(v) A programme aimed pragmatically at standardizing the external tariff in so far as it is strictly

⁴⁶ The assumption is for the ALALC member states to conclude integration agreements for the ensuing five years relating to a minimal list of industries consisting of steel, aluminium, copper, pulp and paper, fertilizers, alkalis, petrochemicals, heavy industrial equipment (for the afore-mentioned sectors and other basic industries), transport material (for road, railway and water-borne transport), machine-tools, textile machinery, energy-generating equipment, mining equipment, tractors and agricultural machinery, roadmaking equipment, and textiles. Sub-regional agreements, or agreements relating to products or limited groups of products, could be concluded over and above a general sectoral agreement, even if the parties had not undertaken to prepare a sectoral agreement within the initial five-year period of the new phase of integration.

necessary to prevent distortions in competitive conditions ruling in the branch of industry concerned;

(vi) A set of commitments for the reconciliation of certain aspects of economic policy which carry most weight in the branch of industry considered (systems of incentives to industry or regulations governing foreign capital and enterprises, tax provisions, etc.), representing the indispensable minimum to avoid obvious distortions; and consultation machinery to mitigate the difficulties that might arise in this connexion in future, since it is deemed very difficult to establish rulings, *a priori*, for all the action called for without the risk of carrying the arduous task of reconciliation beyond the limits of future practical requirements;

(vii) A set of provisions concerning the use of exceptions to the most-favoured-nation clause admitted in the general formula, favouring the aims with respect to a well-balanced regional development set forth in the sample plan prepared for the sector; that is, provisions relating specifically to countries at a relatively less advanced (and medium) stage of economic development;

(viii) Measures for the practical implementation of the provisions and programmes included in the sectoral agreement, use being made of the institutional mechanisms of the common market (the Board and the Investment Promotion Agency) and other instruments which might be created especially for the sector concerned (producers' councils or advisory boards for consultation regarding the harmonization of conditions for inflows of foreign capital, etc.); as a matter of general policy, it might be as well in the early stages to have recourse exclusively to the general organs of the Treaty in the way of permanent bodies, and to accept new sectoral agencies or mechanisms only on a consultation or advisory basis.

IRON AND STEEL DIRECTORY

The *News* is commencing with this issue the publication of a directory of key industries of the ECAFE region. The first instalment comprises a list of iron and steel plants.

It will be observed that the information supplied, which is classified by country, is limited to the names and location of companies or organizations and their production (capacity and actual output) in recent years. These data are based on documents available in ECAFE, supplemented by material from each country.

Despite the scarcity of information pertaining to industry in the region as a whole, it is hoped that this attempt will serve as a springboard for more detailed compilations which would cover such aspects as productivity, wages, employment and capital-output ratios along with other economic parameters of interest to economists and technicians.

The *News* trusts that, for the benefit of future issues of the directory correspondents will get in touch with the editor and supply any supplementary information that may be available within the limits at present adopted.

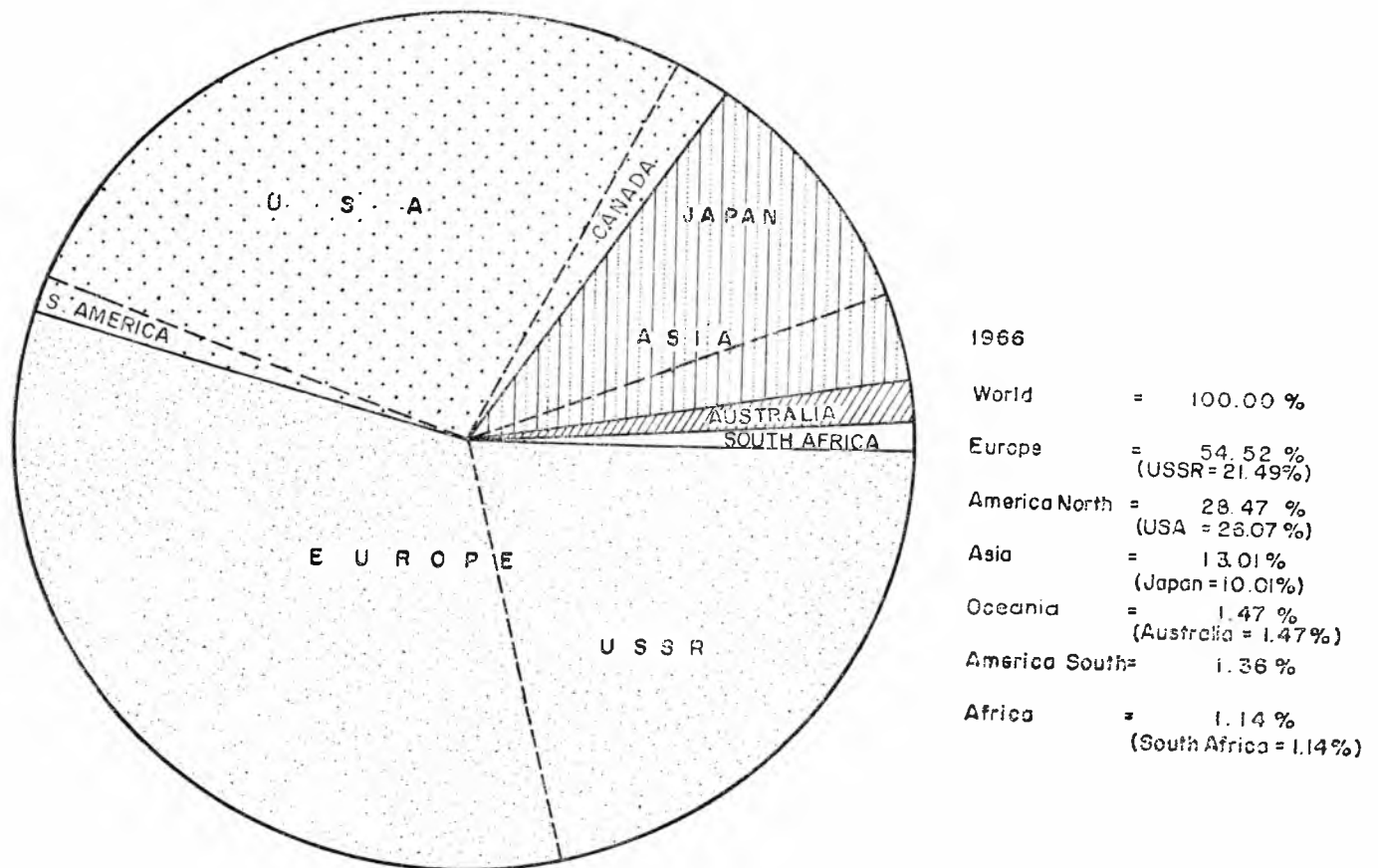


Fig. 1. Production of Pig-Iron and Ferro-Alloys.

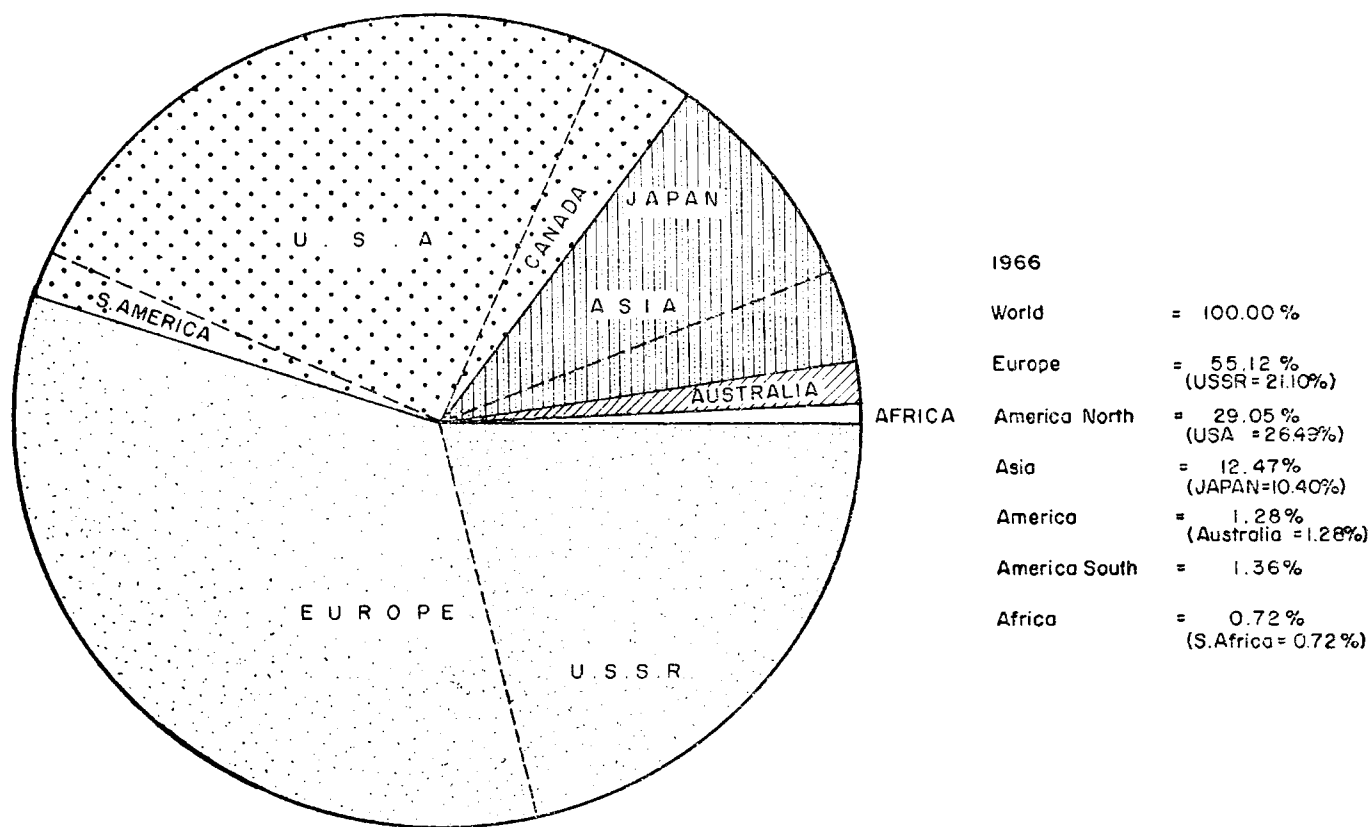


Fig. 2. Production of Crude Steel.

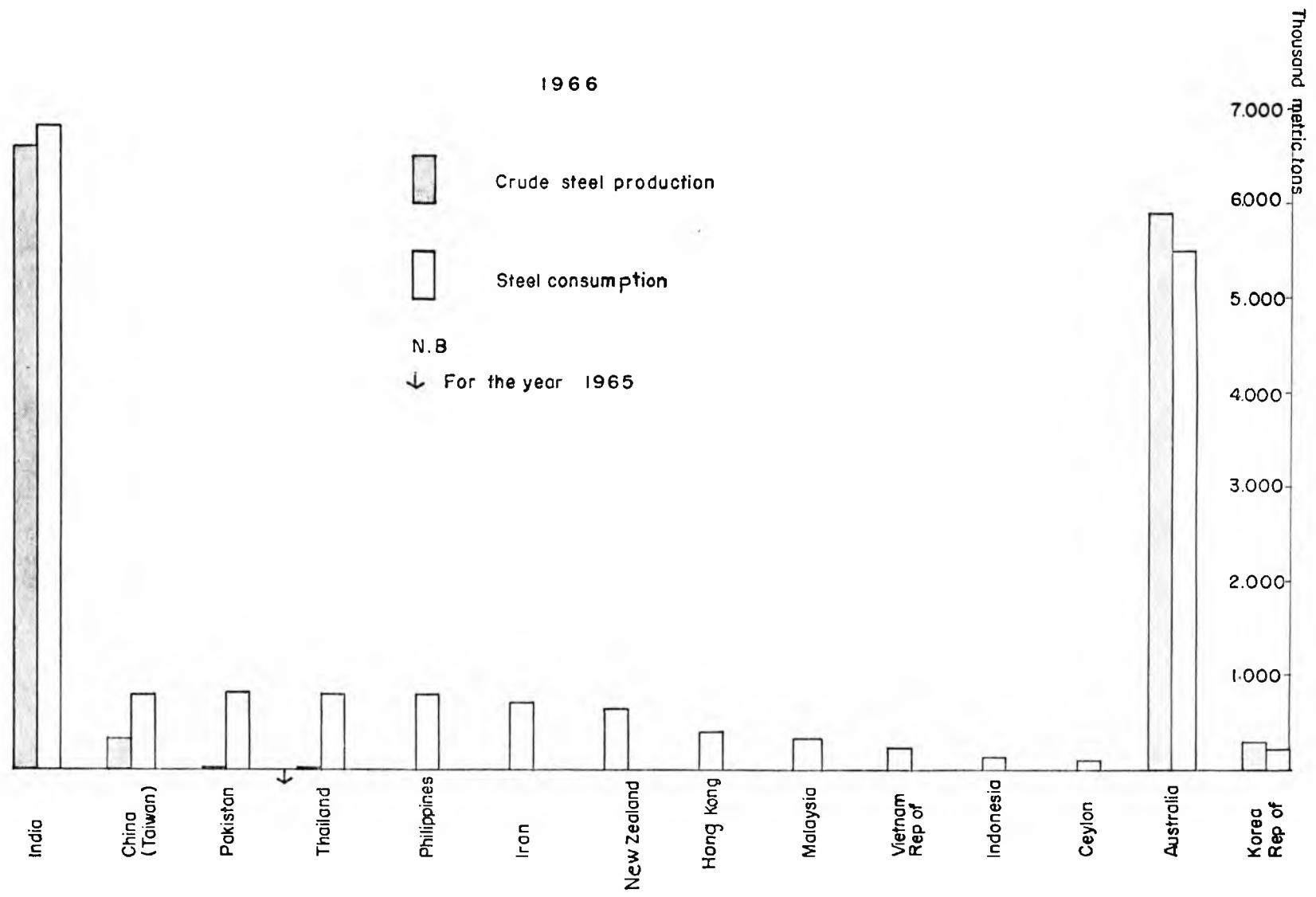


Fig. 3. Production and Consumption of Crude Steel in the ECAFE Region.

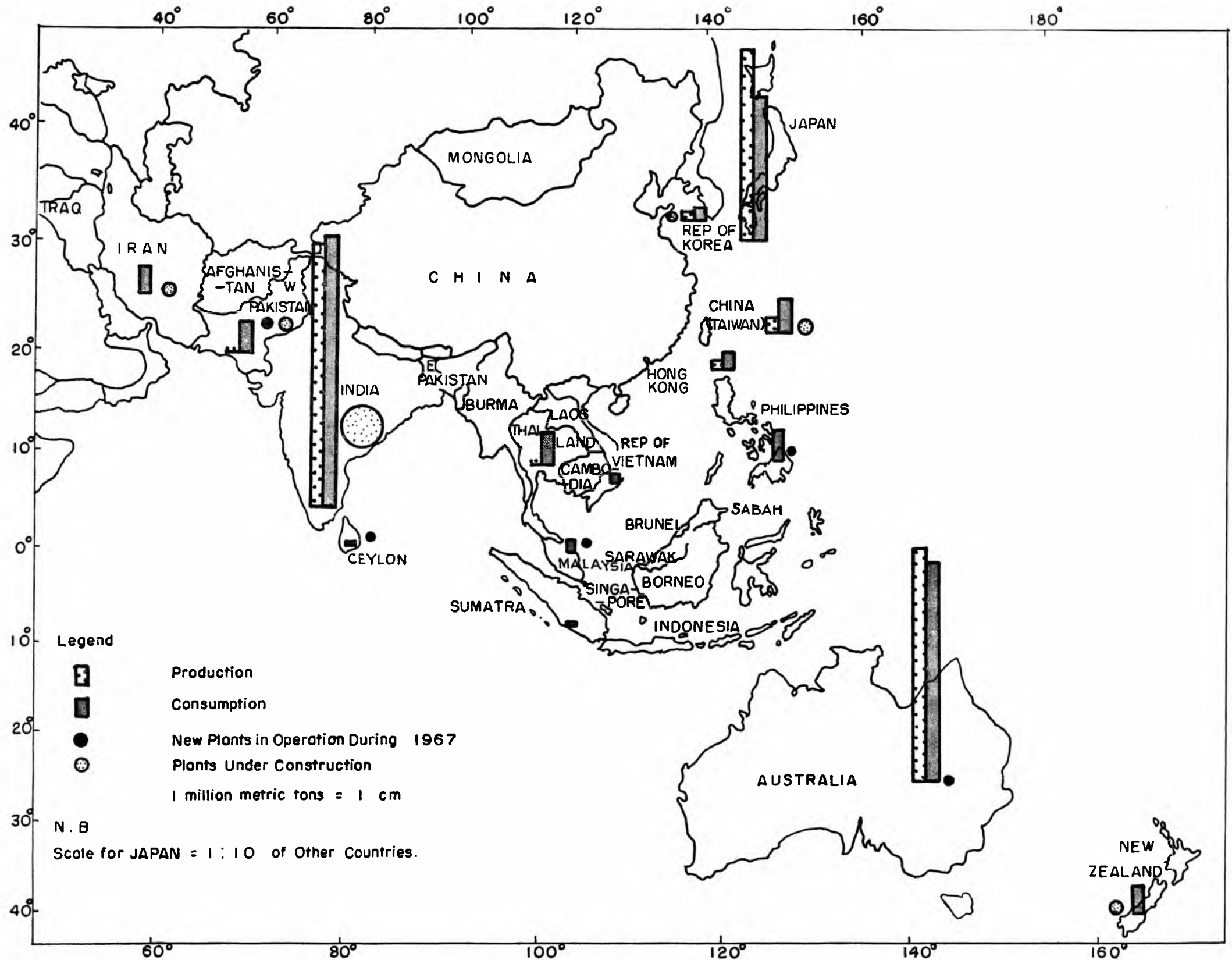


Fig. 4. Production and Consumption of Iron and Steel in ECAFE Region.

IRON AND STEEL PLANTS OF THE ECAFE COUNTRIES

Australia/Burma/Ceylon

<i>Country</i>	<i>Company or organization</i>	<i>Location</i>	<i>Year established</i>	<i>Product mix</i>	<i>Production capacity</i>	<i>Actual output</i>	<i>Remarks</i>
Australia	The Broken Hill Proprietary Co., Ltd. (and its subsidiary)	Newcastle & Port Kembla in N.S.W., Wyalla in SA., Yampi Sound & Karinana in WA and New Caledonia		Finished steel products, hot-dip tinplates	Billets	<i>Tons/year</i> 120,000	Consists of 20 companies
	John Lysaght (Aust.) Ltd.	Port Kembla and Newcastle, N.S.W.		Sheet steel coated and uncoated			
	Stanton Pipes of Australia Pty. Ltd.	Sydney & Melbourne	1962	Spun cast-iron pipes			
	Metter-Clow Pty. Ltd.	Melbourne	Mid-1962	Spun cast-iron pipes			
	Texas Instruments Ltd., S.A. & British Australian Bundy Tubing Co., Pty. Ltd.	S.A.		Welded tubes and bundy tubes			
Commonwealth Steel Co., Ltd.			Special steel and steel products, including alloy and carbon tool steel, forgings, castings, and stainless steel	Steel	100,000	At present: Steel 66,000 tons approximately	Subsidiary of BHP
Burma	Industrial Development Corporation	Ywama		Initial ingots	<i>Tons/year</i> 40,000	1963 Rounds square sheet bars Sheets Barbed wire, wire nails	<i>Tons</i> 9,300 7,200 4,600 Will be expanding to 150,000 tons
Ceylon	Ceylon Steel Corporation		1961	Angles, tees, channels, joints, rounds, flats, squares, hoops, nail wire, tying wire, barbed wire, netting, reinforcing fabric, welded mesh.	Steel products	<i>Tons/year</i> 90,000	<i>Tons</i> <i>April 1966 — March 1967</i> Rounds 1,500 Squares 500 Flats 2,500 Equal angles 4,000 Unequal angles 2,000 T. bars 600 Joints 300 Channels 600 Hot-rolled hoops 1,500 Wire rods 13,000 Wire and wire products 12,000

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output		Remarks	
						Tons/year	1963		Kilo-grammes
China (Taiwan)	Sincere Steel Sheet Corporation	Taipei	1963	Galvanized iron sheet, flat or corrugated	Galvanized iron sheet	24,000	Angles	9,420,000	
	Tang Eng Iron Works Ltd.	Kaohsiung	1940	Angles, light rails, leaf spring stock, black wire, nails, galvanized wire, barbed wire, steel castings, iron castings, concrete pile, concrete pole, concrete pipe, rebar flat bars.			Light rails Galvanized wire Barbed wire Flat bars	1,455,000 11,970,000 3,105,000 60,867,000	
	Taiwan Iron Manufacturing Company			Tin, galvanized sheets and pipes			1965 Sheet, tinned Sheet, galvanized Pipes (welded)	Tons 4,000 11,500 33,500	
Hong Kong	Chiah Hua Iron and Steel Works Ltd.	Hong Kong	1936	Mild steel reinforcing round bars, Mild steel flat bars	Merchant bars	Tons/year 20,000	1963 Mild steel reinforcing round bars Mild steel flat bars	Tons 20,560 950	
	Hong Kong Sakai Steel Pipe Co. Ltd.	Hong Kong		Welded pipes, tubes	Tubes	6,000			
	Hong Kong Tubes and Metal Products	Hong Kong		Welded pipes and spiral-welded pipes		30,000			
India	The Indian Iron and Steel Co., Ltd.	Burnpur, Calcutta	1918	Pig iron, billets, structurals, bars, rails, black and galvanized sheets, coke-oven by-products	Pig-iron Steel ingots Saleable steel	Million Tons/year 1.3 1.0 8.0	1966 Pig-iron Ingots	Tons 1,214,800 924,500	On completion of phase I extension, the output of pig-iron, steel ingots and saleable steel will be increased to 1.46 million tons, 1.30 million tons, and 1.048 million tons per year, respectively
	Durgapur Steel Plant	Durgapur Dist. Burdwan West Bengal	1959	Medium and light structural sleepers, fish-plates, forging blooms and billets, wheels and axles	Steel production	1.0			During the third five-year plan further expansion of the plant is to produce 1.6 million tons of ingot steel, it is expected to be completed by July 1968
	Bhilai Steel Plant	District Durg, Madhya Pradesh	1959	Heavy structurals, rails	Steel ingots Finished saleable steel —These are: rails heavy structural section merchant products wire rods billets	2.5 1.965 0.5 0.25 0.5 0.4 0.315	Pig-iron Steel	1,934,700 1,765,200	During 1966-1970 the capacity will be 3.2 million tons

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks		
India (Continued)	Rourkela Steel Plant	Dist. Sundargarh, Orissa	1958	Flat products, sheets and plates	Million Tons/year 1966		Tons	The existing capacity of the plant is being expanded to 1.8 million tons of steel ingots, to be rolled into 1,225,000 tons of finished saleable steel per year, and will produce electrolytic tinplates, galvanized sheets and electrical steel sheets	
					Steel ingots	1.0	Pig-iron		967,500
					Finished saleable steel	708,000	Steel	976,400	
					—These are:				
					Wide and heavy plates	170,000			
					Hot-rolled sheets, narrow light plates and strips	218,000			
					Cold rolled sheets and strips	170,000			
					Hot-dipped tinplates	50,000			
					Pipes	100,000			
		Mysore Iron and Steel Plant Ltd.	Bhadravati (Mysore State)	1923		Pig-iron	85,400	Pig-iron	75,300	Pig-iron capacity will be expanded from 80,000 tons to 2 lakh tons and a scheme for conversion of the common steel production into alloy and special steels is under implementation
Steel sections	110,500					Ingots	46,300		
½ in. rods	14,000								
Ferro-silicon	20,000								
Cast-iron pipes	25,500								
Cast-iron sleepers	20,000								
Steel castings	2,500								
Cement	89,000								
				Cast-iron castings	6,000				
	Alloy Steel Plant of Hindustan Steel Ltd.	Durgapur West Bengal	1960	Alloy steels, light structurals and railway materials	Tons/year 1966		Tons	During 1966-1970 the capacity of ingots will be 2.5 million tons	
Alloy steel					60,000	Pig-iron Steel	991,200 780,400		
	The Tata Iron and Steel Co., Ltd.	Works: Jamshedpur Sihar State Office: Bombay house 24 Bruce St. Fort, Bombay-1	1907	Bars, structurals, nails, plates, sheets (black and galvanized), skelp strips, electrical steel sheets, wheels, tyres and axles, billets tin bars, blooms, slabs, ferro-man- ganese, and tools such as crowbars, shovels, hammers, etc.	Ingot steel	2 million	1966 Pig-iron	Tons 1,939,000	
Saleable steel					1.5 million	Ingots	2,010,900		
	Bharat Stainless Steel Co., Ltd.	Bombay-7	1964	Stainless steel plates and sheets	Stainless steel	10,000		Production will be expanded to 20,000 tons per year	
	Bhartia Electric Steel Co., Ltd.	Calcutta-1	1921	Finished steel casting, moulded, steel ingots				In 1964 the expansion plan included the increase of production to 12,000 tons/year	
	Bombay Steel Rolling Mills Ltd.	Calcutta-1		Merchant bars, gate channels, small angles, window sections, special sections, wire rods					
	Ferro Alloy Corporation Ltd.	Shruram Bhavan Tumsar (Maharashtra)	1955	High-carbon standard-grade ferro- manganese, silicon manganese, ferro-silicon		1963 High-carbon standard- grade ferro-alloy	Tons 35,929		

Country	Company or organization	Location	Year established	Product mix	Production capacity		Actual output		Remarks	
India (Continued)	Graham Firth Steel Products (India) Ltd.	Bombay-1	1960	Bright cold-rolled steel strip			1963	Tons		
							Bright cold-rolled steel strip	36,000		
	Guest, Keen, Williams, Ltd.	Calcutta	1922	Alloy steel, steel rods and bars, railway materials, rolled sections, spring steel rounds			1963	Tons		
							Alloy and carbon spring steel	15,800		
							Flats and taper	34,000		
							Mild steel bars and rods	61,000		
							Bright steel bars	6,600		
							Pressed steel road wheels	154,000		
							Bolts, nuts, rivets, etc.	30,500		
									Gross	
				Wood screws	5,600,000					
				Safety pins	2,400,000					
						Forging				
				Railway forging	800,000					
				Automobile and other forging	386,000					
				Mild steel railway-track fittings	9,500,000					
				Spring steel railway-track fittings	1,000,000					
	J.K. Iron and Steel Co. Ltd.	Kanpur, U.P.	1936	Bars and rods, hoops, cotton baling and armouring steel tapes for cables, gate channels and small angles			1963	Tons		
						Bars and rods	14,250			
						Hoops	1,030			
						Steel castings	860			
	Khandelwal Ferro Alloys Ltd.	Bombay-1	1958	Standard-grade ferro alloy		Tons/year	1963	Tons		
						Standard-grade high-carbon ferro-manganese	23,961			
						Silico-manganese	20			
						Ferro-silicon	15,600			
	Khemchand Rajkumar	Calcutta-1		Tin plates	Hot-dipped tinplates	24,000				
	Madras Alloy and Stainless Ltd.	Madras-2	1963	Stainless steel sheets, alloy steel bars, rods, forged and rolled	Stainless steel sheets	7,000				
					Alloy steel	3,500				
	Mahindra UGINE Steel Co., Ltd. (Musco)	Khopoli (66 miles from Bombay)	1963	Alloy steel	Finished products	18,000			Started operation in 1966	
	Mukand Iron and Steel Works Ltd.	Bombay 70AS	1938	Rolled products, wire rods, cast products, finished individual castings			1963	Tons		
						Wire rods	45,988			
									In 1965 the capacity of finished castings was 10,000—12,000 tons/year	

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks
India (Continued)	Steel Rolling Mills of Hindustan Private Ltd.	Calcutta 27	1953	Steel ingots, rods and bars		1963 Ingots Rods and bars from 8-65 mm	Tons 4,959 30,654
	The Sun Rolling Mills Private Ltd.	Calcutta 6	1941	M.S. rounds, squares and flats of all sizes; structural and railway fish-plates and other components		1963 Mars and rods Angles Fish-plates	Tons 2,134 113 932
	The Tinplate Company of India Ltd.	Calcutta 1	1920	Tinplates		1963 Tin plates	Tons 84,107
	National Engineering Co., Ltd.	Calcutta-1		Merchant bars, light structural, etc.			
	National Rolling and Steel Ropes Ltd.	Calcutta-1	1942	Bars, wire rods, hard bright and light tensile wire			
	Steel Mills of India Private Ltd.	Calcutta		Bars, angles, gate channels, window sections, etc.			
	Tube Products of India	Madras-1	1955	Tubes $\frac{1}{8}$ in.— $2\frac{1}{2}$ in. diameter, cold rolled strip upto $12\frac{1}{2}$ in. wide			
Indonesia		Banten (W. Java) near Tjilegon	1963	Round bars, small shapes and wire rods and sheets	Steel	Tons/year 120,000	
		Lampung South Sumatra			Pig-iron	50,000	
		Kalimantan (southern)			Steel	250,000	
Japan	Aichi Steel Works Ltd.	Ueno-cho, Chitagun, Aichi Prefecture	1940	Carbon structural steel, alloy structural steel, spring steel, bearing steel, tool and die steel, stainless steel, heat-resisting steel, etc. Rolled products—billets, bars, bar shapes and wire rods. Forge products—forged bars, open and closed die forging. Cold-finished products—machine-turned bars, centreless ground bars, cold-drawn bars and wires, Heat-treated products—normalized bars, annealed bars, and heat-treated bars		1963 Steel production Rolled products Forging products Cold-finished products	Tons 241,300 227,000 8,400 5,900

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks
Japan (Continued)	Amagasaki Iron & Steel Mfg. Co., Ltd. (was merged into Kobe Steel Works on 1 April 1965)	Sakai		Pig-iron, bars, heavy and medium plates			
	Awamura Metal Industry Co., Ltd.	Uji, Kyoto	1963			1963 Tons Ferro-tungsten 678 Ferro-molybdenum 301 Ferro-vanadium 327 Ferro-niobrium 10 Ferro-manganese 3,654 Ferro-silicon-manganese 275 Ferro-chrome 5,316 Ferro-silicon-chrome 182	
	Azuma Steel Works Ltd.	Muromachi, Nihonbashi, Chuo-ku, Tokyo	1933	Bars, sections, wire rods, plates and sheets, steel ingots, galvanized iron coloured sheets			
	Chubu Steel Plate Co., Ltd.	Nagoya	1950	Steel plates		1963 Tons Steel plates 196,515 Abrasion-proof chequered steel plates 57,206	
	Daido Steel Co., Ltd.	Nishiki, Naka-ku, Nagoya	1916	Hot-rolled steel, cold-finished steel, castings, forging spring of automobiles and rolling-stock. Daido-Lectromelt type electric furnace and heat treatment and other industrial furnaces, mining and civil engineering machinery, ferro - manganese, ferro - silicon, secondary steel products, ammunition		1963 Tons Special steel wire rod 48,987 Special steelroll bars 254,615 Castings 9,134 Forgings 16,953 Piercings 6,509 Polished hoop steel 7,311 Spring and band saws 1,770 Ferro-alloys 934	
	Daido Steel Sheet Mfg. Co., Ltd.	Osaka	1950			Tons Cold-rolled steel sheets, sheets or coil 1963 227,124 Galvanized steel sheets 1963 105,629 Point steel sheets 1963 9,449	
	Daitetsu Steel Industrial Co., Ltd.	Taisho-ku, Osaka	1949	Equal and unequal angles, channels, I-Beams, rails and accessories, sheet piling, bright angles, stainless angles, rim and ring bars for car-wheels		1963 Tons Sections 59,500 Channels 20,500 I-beam 6,700 Rails and accessories —light rails 6,200 fish plates 1,100 Sheet piling 4,000 Cold-rolled bright steel 2,200 Other products 11,400	

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks
Japan (Continued)	Ebara Stainless Steel Works, Ltd.	Tokyo	1950	Round bars, flat bars, square bars, deformed bars, round - corner square bars, I-beam wide-flange beams, channels, equal angles, unequal angles, unequal legs, unequal thickness angles, bulb plates, sheet piles, rails, wire rods and bars plates and plates in coil, hot sheets and sheets in coil, hot strips, cold sheets and cold sheets in coil, galvanized iron sheets, and galvanized iron sheets in coil, corrugated galvanized iron sheets		1964 (fiscal year) Bars 147,958 Shapes 499,366 Rails 95,231 Wire rods 455,847 Plates 906,585 Hot sheets, hot sheets in coil and hot strips 1,695,993 Cold sheets and cold sheets in coil 342,763 Galvanized iron sheets and sheet in coil and corrugated galvanized iron sheets 48,097 Tin plates 119,931 Others 84,120	
	Fujikoshi Ltd.	Tokyo	1928	Special steels, tools, etc.			
	Fuji Sanki Pipe and Tube Co., Ltd.	Yaraku-cho, Chiyoda-ku Tokyo	1960	Standard pipe, pressure and mechanical tube, structural tube size $\frac{1}{8}$ in.—14 in.		1963 Pipes and tubes 210,000	Expansion plans included spiral pipe mill and seamless pipe mill
	Fuji Iron and Steel Co., Ltd.	Marunouchi, Chiyoda-ku, Tokyo	1950	Pig iron, semi-finished steels, bars, shapes, wide flange beams, rails, sheet piling, pipe piling, wire rods, plates, hot and cold sheets, hoop, tin plates, galvanized sheets, ZIN-KOTE (Electrolytic galvanized ELLIOSHEET (color printed sheets), CANSUPER (Chromium plated sheets), Electrical sheets, sectional poles, light-gauge steels, beam-guard rails, cable-guard rails, corrugated culvert pipes, coal chemical	Crude steel 12 million tons	1966 Pig-iron 8,062,594 Crude steel 8,931,894 Hot-rolled steel products 5,368,813 Cold-rolled steel products 878,120 Surface-treated sheets 488,523 1967 Pig-iron 9,602,000 Crude steel 10,846,000 Hot-rolled steel products } Cold-rolled steel products } 8,660,000 Surface-treated sheets }	
Hitachi Metal Industries Ltd.	Tokyo	1956	High-grade special sheets, rolls, gourd brand pipe for common use on gas, water, etc., malleable castings for automobiles, industrial machines, metal fittings for wiring, cast steel and forged steel for railway-cars, ships, automobiles, electric machines, etc. light alloy castings, die castings, steel chains, iron castings, ductile iron castings		For October 1962 to September 1963: High-grade special sheets 55,571 Rolled 20,309 Gourd brand pipe 33,286 Malleable castings 17,386 Cast steel and forged steel 27,090 Others 8,028		

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks
Japan (Continued)	Japan Iron-Sand Steel Co., Ltd.	Osaka	1934	Bars, rails, fish-plates, special steels			
	Japan Special Steel Co., Ltd.	Tokyo	1915	High-speed steels, carbon and alloy tool steels, die blocks, bearing steels, quality carbon and alloy steels, spring steel, stainless steels, heat-resisting steel and super-heat resisting alloys, highest grade forgings in carbon and alloy steels, hardened and ground forged steel rolls, permanent magnets, cast and sintered, flexible magnets, Hatebur precision forging rings, Wagner rolling rings, round bars, forging, square bars, flat bars		1963 Output	Tons 96,000
	The Japan Steel Works, Ltd.	Chiyoda-ku, Tokyo	1907	Steel ingots and semi-finished products and steel plates, steel castings and forgings, welded structures.		1963	Tons
						Steel ingots:	
						Forged steel	39,617
						Cast steel	17,975
						Rolled steel	160,100
						Semi-finished products:	
					Forged steel	30,983	
					Cast steel	12,480	
					Steel plates:		
					Ordinary steel	95,990	
					Special steel	17,589	
	Kansai Steel Corporation	Sakai-city	1928	Bars and sections.			
	Kanto Special Steel Works, Ltd.	Fujisawa City Kanagawa Pref.	1936	Forged steel-work rolls fully hardened, forged steel back-up rolls solid and composite, cast-steel rolls, cast-iron rolls, ductile cast-iron rolls, die block steels, other special steel products		1963	Tons
						Forged steel	3,210
						Cast-steel rolls	1,830
						Cast-iron rolls	1,330
						Ductile cast-iron rolls	300
						Die block steel	600
						Other special steel products	360
	Kanto Steel Co., Ltd. (Recently merged into Daido Steel Co., Ltd.)	Kanto Seiko Tokyo		Special steels including stainless in bars, wire rods, sections and wire			
	Kawasaki Steel Corporation	Fukiai-ku, Kobe	1950	Plates, high-tensile strength plates, hot-rolled sheets and strip, galvanized sheets and coils, electro-galvanized sheets and coils, pre-tained galvanized sheets and coils, tinplates, stainless steel plates, sheets and strip, stainless-clad-plates, sheets and strips, electrical sheets and strips, alloy and high-carbon steels, electric-resistance-welded pipe, spiral-welded pipe, corrugated pipe, wide-flange shapes, bars, rods, and wire rope, casting and forgings iron powder, rolls and moulds, welding electrodes, footing boards, measuring and weighing machines		1966 1967 Tons Tons	
						Pig-iron	4,368,000 5,354,000
						Crude steel	5,751,000 7,457,000
						Steel prod.	4,701,000 6,039,000

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output		Remarks						
						1966 Tons	1967 Tons							
Japan (Continued)	Kobe Steel Works, Ltd.	Fukiai-ku, Kobe	1905	Wire rods, bars and shapes, pig-iron, steel ingot and semi finished steel products, processed steel products, and other products			Pig-iron	2,285,500	3,219,727					
							Crude steel	2,850,698	3,436,781					
							Steel prod.	2,187,005	2,542,347					
							1. Kobe Plant	Wire rods, bars and shapes						
							2. Chofu North Plant	Steel tubes, shapes	Steel tubes, shapes	Tons/year	30,000			
							3. Kochi Plant	Ferro-alloys	Ferro-alloys		33,960			
							4. Takasago Plant	Cement machinery, chemical machinery, metal fabricating machinery, rolling stock, parts for power plants, etc.						
							5. Okubo Plant	Chemical machinery, cement machinery, construction machinery, small tools						
							6. Akashi Plant	Small tools						
							7. Nagoya Plant	Aluminium and magnesium castings and die casting, cast-iron, small forged steel products			5,880			
							8. Ibaraki Plant	Arc welding electrodes, union-melt			45,600			
							9. Hidaka Plant	Arc-welding electrodes			24,000			
							10. Fujitsuwa	Arc-welding electrodes			33,600			
11. Moji Plant	Copper and copper-alloy products			24,000										
12. Chofu Plant	Aluminium and aluminium-alloy products, copper and copper-alloy products			60,480										
	Kokko Steel Works Ltd.	Yoshi-ku, Osaka	1934	Bars, sections, wire rods, special steels, shapes										
	Kubota Iron & Machinery Works Ltd.	Osaka	1890				1963 Tons							
							Cast-iron pipes	200,400						
							Ingot mould	80,000						
							Special welded pipes	24,000						
							Cast steel	15,000						
							Iron steel	37,000						
							Pig-iron	80,000						

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output		Remarks
						1963	Tons	
Japan (Continued)	Kurimoto Iron Works Ltd.	Osaka		Centrifugal ductile cast-iron pipe, light steel pipe, welded steel pipe, special welded steel pipe, concrete pipe and pile, valve, iron and steel castings, industrial machinery, bridge and steel structures	Cast-iron pipe Iron and steel casting	77,159 4,528		
	Kyoei Steel Co., Ltd.	Osaka	1909	Wire rods, bars				
	Mikuni Stainless Steel Strip Mfg. Co., Ltd.	Osaka		Stainless steel strip				
	Mitsubishi Steel Mfg. Co., Ltd.	Chiyoda-ku, Tokyo	1949	Special steel plates, high-tensile and boiler plates, clad plates, hot-rolled and cold-finished bars, hollow drill steel bars, springs, magnets, steel castings				
	Myodo Metal Co., Ltd.	Niigata Pref.		Stainless steel bars, wire rods, angles, plates and cold-rolled sheets				
	Nakatsu Steel Sheet Co., Ltd.	Oita Pref.		Plates, sheets, expanded metal				
	Nakayama Steel Products Co., Ltd.	Chiyoda-ku, Tokyo	1950	Ingots, heavy and medium plates, cold-rolled sheets, tinplates, galvanized sheets, coloured galvanized sheets, light-gauge steel, mild steel sheets, mild steel bars				Expansion plans include a continuous galvanizing line
	Nakamaya Steel Works Ltd.	Taisho-ku, Osaka	1923	Pig-iron, ingots, bars, wire rods, sections, plates and sheets, galvanized sheets, black galvanized and barbed wire, wire products				
	Nippon Hikinuki Industry Co., Ltd.	Osaka Pref.		Seamless and welded stainless steel tubes				
	Nippon Kinyoku Co., Ltd.	Chiyoda-ku, Tokyo	1930	Stainless steel strip, etc.				
						1966 Tons	1967 Tons	
Nippon Kokan Kabushiki Kaisha	Chiyoda-ku, Tokyo	1912	Pipe and tubing, hot-rolled sheets and coils, cold rolled sheets and coils, plates, bars and shapes, tinplates, galvanized sheets, fabricated steel products	Pig-iron Crude steel Steel prod.	4,962,000 5,727,202 4,439,000	6,383,199 7,290,386 5,848,215		This company is building the fourth integrated Fukuyama Iron Works with a capacity of 6 million tons of ingots, when this is completed, the company will have a capacity of 10,000,000 tons of ingots

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks		
Japan (Continued)	Nippon Koshuha Steel Co., Ltd.	Tokyo	1950			1963	Tons	By May 1964 a wire rod mill was expected to be completed and by June 1964 a wire-drawing shop was expected to be completed	
						Iron sand	114,400		
	Nippon Metal Industry Co., Ltd.	Tokyo	1932	Special steel: stainless steel bars, plates, hot- and cold-rolled sheets, welded tubes, strip, wire			Pig-iron for steelmaking	51,000	
							Pig-iron for special castings and magnetic soft iron ingots	12,000	
	Nippon Stainless Steel Co., Ltd.	Tokyo	1934	Stainless steel bars, wire rods, sections, plates, hot- and cold-rolled sheets			Ball-bearing steel	24,300	
							High-speed steel, stainless steel, heat-resistant steel, carbon tool steel, alloy tool steel, structural steel, structural carbon and alloy sheets	5,000	
	Nippon Yakin Kogyo Co., Ltd.	Tokyo	1935	Stainless steel products: sheet in coil, castings, ferro-nickel	Hot-rolled plates	Tons/year	1963	Tons	A Sendjimin hot planetary mill was expected to be completed by 1965
						7,200	Plate	10,300	
						14,400	Sheet	15,667	
						36,000	Hoop	6,349	
						48,000	Bar	980	
						14,400	Wire rod	3,240	
Nisshin Seiko Co., Ltd.	Himeji City Hyogo Pref.	1948	Ordinary and special steel ingots, ordinary steel bars and shapes, special steel bars, deformed bars			1963	Tons		
						Output	75,773		
Nisshin Steel Co., Ltd.	Chiyoda-ku, Tokyo	1928	Hot-rolled steel plates and sheets, cold-rolled steel plates and sheets, white hoops, hot- and cold-rolled stainless steel plates and strips, high carbon and alloy steels			1966	1967		
						Tons	Tons		
						Pig-iron	1,258,000		1,512,000
Nisso Steel Mfg. Co., Ltd.	Tokyo	1949	Pig-iron, plates, plain and deformed reinforcing rounds, ferro alloys, etc.			Steel ingots	1,591,000	1,987,000	
						Steel prod.	1,245,000	1,588,158	
Ohara Seisakusho Co., Ltd.	Tokyo		Stainless steel strips						
Osaka Shipbuilding Co., Ltd.	Minato-ku, Osaka	1936	Cold-rolled strip and sheets, galvanized sheets, plastic-coated steel and aluminium sheets, etc.						
Osaka Steel Mfg. Co., Ltd.	Osaka		Bars, wire rods, sections						

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks
Japan (Continued)	Otani Heavy Industrial Co., Ltd.	Sumida-ku, Toyko	1940	Ingots, bars, sections, plates, etc.			
	Otani Steel Works Ltd.	Osaka		Bars, sections, plates			
						<i>October 1962 — September 1963</i>	
						<i>Tons</i>	
	Sanyo Special Steel Co., Ltd.	Shikama-ku Himeji	1933	Bearing steels, stainless steels, structural carbon steels, structural alloy steels, cutting steels, tool steels, spring steel, heat-resisting steels, other alloy steels, tubes, bars and wire		Special steel bars	212,189
						Special steel tubes	29,214
						Ingots	326,833
	Shimura Koko Co., Ltd.	Tokyo		Stainless steel bars, angles, wire rods, plates, ferro-nickel, electrolytic nickel			
	Stainless Pipe Industry Co., Ltd.	Osaka		Seamless and welded stainless steel tubes			
	Sumitomo Electric Industries Ltd.	Osaka		Wire rods, piano wire			
							<i>1966</i>
							<i>1967</i>
							<i>Tons</i>
							<i>Tons</i>
Sumitomo Metal Industries Ltd.	Higashi-ku, Osaka	1897	Blooms, billets, slabs, bars, carbon alloy and special steel, structural beams and shapes, strip, hoop, skelp, sheets and plates, wire rods, wire, pipes, wheels, axles, tyres, concrete reinforcing bars, pipe and piling manufactured products		Pig-iron	4,052,913	5,466,020
					Crude steel	5,477,214	7,384,980
					Hot-rolled ordinary steel	3,718,095	4,967,443
					Special rolled steel	461,540	698,754
					Casting (as-cast)	14,949	21,311
					Forging (as-forged)	118,923	119,268
Taihei Kinjohu Kogyo Co., Ltd.	Tokyo		Stainless steel bars				
Takasago Tekko K.K.	Tokyo		Stainless steel strips				
Tekkoshu Co., Ltd.	Chuo-ku, Tokyo	1928	High, medium and low carbon ferro-manganese, silico-manganese, ferro-silicon, silico-chrome, high-carbon ferro-chrome, etc.				
Toa Seiki Co., Ltd.	Tokyo		Welded stainless steel tubes.				
Tohoku Metal Industries Ltd.	Koriyama Sendai	1938				<i>1963</i>	<i>Tons</i>
					Pure iron		1,400
					Nickel		27
					Permalloy		44
					Other magnetic alloy		8

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks
Japan (Continued)	Tohoku Special Steel Works Ltd.	Miyagi Pref.	1937	Special steels, including stainless steel bars, wire rods and strips			
	Tokushu Densetsukan Kogyo Co., Ltd.	Chiba Pref.		Welded stainless steel tubes			
	Tokushu Kinyoku Kogyo Co., Ltd.	Tokyo	1940		1963	Tons	
					Cold-rolled carbon steel strip	3,000	
					Cold-rolled steel strip	500	
					Cold-rolled stainless steel strip	700	
	Tokushu Seiko Co., Ltd.	Tokyo	1929		1963	Tons	
					Tool steels	14,300	
					Special-purpose steels	16,600	
					Constructional steels	41,700	
	Tokyo Honetsukan Seijosho Ltd.	Chiba Pref.		Seamless stainless steel tubes			
	Tokyo Steel Manufacturing Co., Ltd.	Tokyo	1934	Small ingots, equal angles	1963	Tons	300,000
	Tosa Steel Works Ltd.	Kagawa Pref.		Ingots, round bars	1963	Tons	
					Ingots	92,140	
				Plain bars	50,628		
				Deformed bars	3,023		
Toshiba Steel Co., Ltd.	Adachi-ku, Tokyo	1950	Bars, sections, angles, U-shaped-fence post, ingots				
Toto Steel Mfg. Co., Ltd.	Tokyo	1943	Sections				
Toyo Kohan Company Ltd.	Chiyoda-ku, Tokyo	1934	Tin plates, steel sheets, vinyl-coated.	1963	Tons		
				Electrolytic tinplate	121,000		
				Hot dip tinplate	35,000		
				Vinyl-coated steel sheet	8,000		
				Chemically heated steel sheets	17,000		
				Cold-rolled sheet	238,000		
Watanabe Metal Industry Co., Ltd.	Tokyo		Welded stainless steel tubes				
Yamato Steel Works Ltd.	Nishinari-ku, Osaka	1923	Hot-rolled plates, hot-rolled steel shapes, round bars, square bars, angles, channels, high-tensile deformed bars, high-tensile steel plates, arc welded steel pipes, arc welded H-beams	1963	Tons		
				Plates	161,648		
				Bars	24,820		
				Sections	16,316		
				Large H-beams	207		

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output		Remarks	
						1966 Tons	1967 Tons		
Japan (Continued)	Yawata Iron and Steel Co., Ltd.	Chiyoda-ku, Tokyo	1950	Pig-iron, finished products, semi-finished products, rails and accessories, sheet piling, wide flange shapes, Jumbo-H, H-Piling, equal angles, unequal angles, bulb plates, channels, I-Beams, round bars, etc.	Production capacity as at June 30, 1964: Iron making (pig iron) 5,770,000 Steel making (Steel ingots) 9,687,000 Rolling (hot rolled prod.) 7,335,000	Pig-iron 7,552,455 Crude steel 9,746,497 Steel prod. 7,964,184	9,185,490 11,887,791 9,624,691		
	Yawata Steel Tube Co., Ltd.	Tokyo	1935	Tubes and pipes		1963 Seamless Welded Spiral welded	Tons 41,000 119,000 18,000		
	Yodogawa Steel Works Ltd.	Osaka	1935	Cold-rolled sheets and strips, galvanized sheets and strips, cast-iron rolls, cast-steel rolls, porcelain-enamelled sheets, pre-painted sheets and strips, cold-rolled hoops					
Korea, Republic of	Inchon Heavy Industry Corporation (formerly Daihan Heavy Industry Corporation)	Seoul	1962 (1953)	Finished steel, billet, sheet, bars, etc.	Iron	Tons/year 300,000	1963 Billets Sheet bars Concrete reinforcing bars, plain and deformed Round bars, angles, channels Steel sheets	Tons 39,112 22,087 18,676 6,509 12,728	By 1964, the capacity of steel ingots was 100,000 tons/yr on a cold charge basis and 150,000 tons/yr on a partially moulton charge and the capacity of ingot-making was 300,000 tons
	Alsan Integrated Works			Slabs, large and medium sections and flat products					This plant will be built by the Government
	Union Steel Mfg. Co., Ltd. (Co-operation with the Yawata Iron & Steel Co., Ltd.)		1967	Cold-rolled sheets and galvanized sheets		100,000			
	Il Shin Industrial Co.				Cold-rolled sheets	45,000			Under construction
	Korea Steel Co.			Plates for strip building and other building purposes	Plates	100,000			
	Kukdong Steel Co.				Steel ingots	30,000			
	Inchon Iron Works				Sponge iron Pig iron Crude steel Billets Hot strip	250,000 125,000 350,000 100,000 100,000			

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks
Malaysia	Malaya Yawato Steel Ltd. (Yawata Iron & Steel)	Pari		Bars, ingots			Under the expansion plan for 1967 the production capacity was to have been 300,000 tons/yr
New Zealand	Pacific Steel Limited	Otahuhu (Auckland)	1962	Merchants bars from domestic up- rising including: round bars, de- formed bars, squares, flats, angles			When fully completed the plant will have a rolling capacity in excess of 200,000 tons/yr and production is expected to reach 180,000 tons by 1970.
	New Zealand Steel Limited	Glenbrook (Huntly County, Auckland)		Billets, hot-rolled strip, cold-rolled strip, galvanized sheets, welded pipes, tinplates, sections and rails			Production was scheduled to commence in October 1968
Pakistan	East Pakistan Industrial Development Corporation	Motijheel Dacca 2	1962		<i>Tons/year</i>		
					Steel ingots	150,000	
					Bars and shapes	45,000	
					Corrugated galvanized sheets	40,000	
					Plain sheets	6,000	
					Block sheets	4,000	
Medium plates	15,000						
	National Steel Of Pakistan Ltd.	Karachi 2	1962	Round bars in all sizes, shapes and sections; flats and angles in all sizes, shapes and sections; tees, channels, bars, machinery parts of cast iron		<i>1963</i> Mild steel products Cast iron products	<i>Tons</i> 7,220 100
	Pak Steel Works	Chittagong East Pakistan	1959				
	The Panjab Steel Rolling Mills	Misri Shah Lahore West Pakistan		Re-rolled squares and flats			
	Star Rolling Mills Ltd.	Karachi	1947	Mild steel tees, angles, channels, flats, Z sections, rounds		<i>1963</i> Mild steel products	<i>Tons</i> 3,000
	Steel Corporation of Pakistan Limited	Karachi	1955	M.S. bars, wire rods, angles, chan- nels, joints, tees, bailing hoops, cold hoops, hard-drawn wires, annealed wires, galvanized wires		<i>1963</i> Steel products	<i>Tons</i> 31,721

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks
Philippines	Marcelo Steel Corp.	Office: Northern Hills Malabon, Rizal	1952	Wire nails, welded wire, nail, galvanized hard-drawn black iron, wire	Rolling Melting	<i>Tons/year</i> 60,000	Expansion plans: Increase capacity of wire rods to 36,000 tons/yr and equip- ment for the manufacture of spiral nails, of mixed fertilizer, etc.
		Plant: Punta, Sta. Ana., Manila				30,000	
	Philippine Blooming Mills, Inc.	Office: 666M de Binondo Manila	1951		Rolling Melting	40,000 60,000	
		Plant: Bo. Rosario, Pasig, Rizal					
	International Steel Manufacturing	Office: 66A Bonifacio Drive, Quezon City			Rolling Melting	63,000 18,000	
		Plant: Manaluyong Rizal					
	Central Steel Mfg. Co., Inc.	Office: 2 Katigbac, Paranague Rizal	1951		Rolling	30,000	
		Plant: Paranague Rizal					
	Iligan Integrated Steel Mills, Inc.	Office: FGR Bldg. Makati, Rizal	1955		Rolling Melting	60,000 70,000	
Plant: Iligan Mindanao							
National Shipyards & Steel Corporation (NASSCO)	Engineer Island Manila	1950		Pig iron	40 tons/day	<i>1963</i> Ingots Reinforcing steel bars	<i>Tons</i> 19,979 15,072
Southern Rolling Mills Inc. (cold-rolling mill)	Office: 9118 Sultana Makati, Rizal	1963		Rolling	<i>Tons/year</i> 120,000		
	Plant: Cortes, Bohol						
Elizalde Iron & Steel Corp. (cold-rolling mill)	Bo. San Joaquin, Pasig, Rizal	1962		Rolling	100,000		

Country	Company or organization	Location	Year established	Product mix	Production capacity	Actual output	Remarks	
Singapore	National Iron and Steel Mills Ltd.	Robinson Rd. Singapore I	1961	Mild steel round bars, high-tensile deformed bars, mild steel flat bars, mild steel square bars, mild steel reinforcing bars, mild steel merchant bars, angles, channels, flat bars, window sections, wire rods, etc.	Wire rods	<i>Tons/year</i> 20,000	Under the expansion plan 1970-1975, steel products will be increased to 250,000 tons/yr.	
	Malayan Iron and Steel Mills	Woodlands North of Singapore	1962	Mild steel round bars Mild steel flat bars Mild square bars	Steel bars	10,000	Round and flat bars <i>Tons</i> 6,000	Another set of rolling-mills will go into operation soon, and will produce 1,000 tons/month
	Simalpan Steel Industries	Jurong Dist. Singapore		ERW tubes and spiral welded pipes	ERW tubes Spiral welded pipes	10,000 5,000		
	Other works (new enterprises)							
	1. Federal Iron Work Ltd. (Nomura Trading Co.)	Singapore		Galvanized sheets				
	2. Malaysia Pipe Manufacturing Co., Ltd. (Maruichi Steel Tube Works Ltd.)	Singapore		Welded pipes	Welded pipes	12,000		
3. Singapore Galvanizing Industries Ltd. (Kawasaki Steel Corp., Yodogawa Steel Works Ltd., Marubeni Iida Co., Ltd. & C. Itoh & Co., Ltd.)	Singapore		Galvanized sheets					
Thailand	G.S. Steel Co., Ltd.	Office: Bangkok Factory: Samudprakarn	1968	Round bars (reinforcing)	Round bars	<i>Tons/year</i> 150,000		
	Thai Steel Co., Ltd.	Bangkok	1967	Steel	Steel	55,000		
	Sinthorne Industry Co., Ltd.	Office: Bangkok Factory: Samudprakarn	1967	Steel wires, galvanized iron sheets, round bars	Steel wires Galvanized iron sheets Round bars	47,000 500 8,000		
	Sangkasi Thai Co., Ltd.	Samudprakarn	1962	Galvanized iron sheets	Galvanized iron sheets	70,000		

SELECTED SHORT-TERM INDUSTRIAL INDICATORS — ECAFE REGION

Index Number of Industrial Production

- Production of
- 1) Textiles
 - 2) Paper
 - 3) Chemicals
 - 4) Cement
 - 5) Crude steel

Selected Short-term Industrial Indicators — ECAFE Region

Index Number of Industrial Production

1963 = 100

Country and industry	Year	January	February	March	April	May	June
<i>Australia</i>							
Manufacturing	(1967)	86	124	123	119	120	117
	(1968)	88	127	130	125	125	...
<i>China (Taiwan)</i>							
Mining	(1967)	154	87	131	130	131	122
	(1968)	135	88	126	127	138	136
Manufacturing	(1967)	213	177	210	188	191	190
	(1968)	236	216	243	237	235	225
<i>India</i>							
Mining	(1967)	110	108	117	115	119	110
	(1968)	119	119	117	...	...	...
Manufacturing	(1967)	120	110	119	108	113	115
	(1968)	120	124	122	112	114	...
<i>Iran</i>							
Mining	(1967)	...	...	...	-----	163	-----
	(1968)	-----	180	-----	...	...	...
Manufacturing	(1967)	...	...	...	-----	142	-----
	(1968)	-----	135	-----	...	...	...
<i>Japan</i>							
Mining	(1967)	101	102	114	102	103	105
	(1968)	100	104	112	103	101	102
Manufacturing	(1967)	143	151	167	155	157	164
	(1968)	168	180	194	185	188	193
<i>Korea, Republic of</i>							
Mining	(1967)	130	121	142	141	146	136
	(1968)	108	108	119	119	122	115
Manufacturing	(1967)	157	152	168	173	188	186
	(1968)	227	232	265	272	285	293
<i>New Zealand</i>							
Manufacturing	(1967)	-----	127	-----	-----	128	-----
	(1968)	-----	125	-----	-----	124	-----
<i>Pakistan</i>							
Mining	(1967)	-----	117	-----	-----	177	-----
	(1968)	...	...	...	...	...	...
Manufacturing	(1967)	-----	153	-----	-----	146	-----
	(1968)	...	...	...	...	...	...
<i>Philippines</i>							
Mining	(1967)	-----	129	-----	-----	141	-----
	(1968)	-----	156	-----	-----	145	-----
Manufacturing	(1967)	-----	124	-----	-----	129	-----
	(1968)	-----	128	-----	-----	-----	-----
<i>Viet-Nam, Republic of</i>							
Manufacturing	(1967)	-----	158	-----	-----	176	-----
	(1968)	-----	125	-----	...	...	...

Source: United Nations Monthly Bulletin of Statistics.

Production of Textiles, Paper, Chemicals, Cement and Crude steel

Country and industry	Year	January	February	March	April	May	June
COTTON YARN (thousand metric tons)							
Australia	(1967)	0.96	2.40	2.41	2.29	2.81	2.67
	(1968)	1.10	2.25	2.44	2.14	2.63	2.42
China (Taiwan)	(1967)	6.00	4.56	6.47	5.88	5.96	6.14
	(1968)	5.86	5.28	5.14	5.09	5.74	5.50
Hong Kong	(1967)	—————	10.71	—————	—————	11.37	—————
	(1968)	—————	11.73	—————	—————	12.40	—————
India	(1967)	71.4	64.4	72.2	70.6	77.0	75.4
	(1968)	80.0	78.7	79.2	78.8	79.4	79.3
Japan	(1967)	38.5	43.8	41.5	44.0	42.4	44.2
	(1968)	42.0	47.2	45.5	47.9	44.7	46.3
Korea, Republic of	(1967)	5.06	4.75	5.79	6.28	5.75	6.28
	(1968)	6.00	6.20	5.90	5.66	6.39	6.11
Pakistan	(1967)	19.1	18.4	18.8	20.0	21.8	21.2
	(1968)	21.5	21.5	21.0	19.3	19.4	22.3
Philippines	(1967)	2.28	2.33	2.00	1.98	1.75	1.52
	(1968)	1.86	2.20	2.44	2.29	1.59	1.76
Viet-Nam, Republic of	(1967)	0.63	0.40	0.67	0.60	0.57	0.58
	(1968)	0.39	0.01	0.33	0.34	0.29	0.36
WOVEN COTTON FABRICS (million square metres)							
Australia	(1967)	2.12	4.69	5.12	4.90	5.75	5.40
	(1968)	2.33	4.85	5.37	4.64	5.61	5.10
China (Taiwan) ^a	(1967)	24.6	20.5	30.6	26.8	31.8	27.5
	(1968)	30.5	23.6	37.6	28.8	29.0	31.1
India ^a	(1967)	324	291	326	318	350	348
	(1968)	374	361	365	366	369	359
Japan	(1967)	230	246	241	245	239	235
	(1968)	219	230	227	234	228	233
Korea, Republic of	(1967)	20.1	19.0	24.9	25.6	28.1	27.0
	(1968)	23.7	26.1	24.2	24.1	27.2	24.6
Pakistan ^a	(1967)	53.8	53.6	57.5	59.8	64.6	58.9
	(1968)	57.6	60.5	57.2	62.8	63.1	62.2
Philippines ^a	(1967)	11.5	12.2	13.0	14.7	14.4	14.0
	(1968)	17.1	15.5	17.3	16.1	15.3	14.7
Viet-Nam, Republic of ^a	(1967)	3.94	2.25	4.37	3.50	3.66	3.70
	(1968)	1.81	—	1.59	2.04	1.16	1.56
RAYON AND ACETATE FILAMENT and FIBRES (thousand metric tons)							
China (Taiwan)	(1967)	0.64	0.57	0.56	0.64	0.61	0.62
	(1968)	0.61	0.51	0.81	0.45	0.70	0.66
India	(1967)	7.27	6.35	6.99	7.15	7.64	7.77
	(1968)	8.40	7.99	8.55	7.97	7.84	7.75
Japan	(1967)	44.1	42.7	44.3	44.5	44.0	44.3
	(1968)	43.1	41.6	42.3	42.3	42.7	42.3

Note: ^a Million metres.

Country and industry	Year	January	February	March	April	May	June
WOVEN RAYON and ACETATE FABRICS (million square metres)							
Australia	(1967)	1.21	2.52	2.59	2.56	2.75	3.19
	(1968)	1.22	2.39	2.85	2.36	3.09	2.92
China (Taiwan) ^a	(1967)	3.33	2.83	4.09	3.57	3.74	3.36
	(1968)	4.95	5.19	6.16	4.89	5.89	5.50
India ^a	(1967)	76.8	70.8	71.0	66.9	72.4	68.8
	(1968)	84.8	92.6	76.2	79.6	80.2	...
Japan	(1967)	127	130	130	135	137	140
	(1968)	127	131	132	137	136	137
Korea, Republic of	(1967)	5.62	5.63	5.76	5.96	5.97	5.98
	(1968)	6.20	5.69	5.70	5.90	6.12	6.15
Pakistan	(1967)	3.06	3.45	3.55	3.23	3.15	2.90
	(1968)	3.96	4.19	4.26	4.10	4.07	4.01
NEWSPRINT (thousand metric tons)							
Australia	(1967)	8.18	7.99	8.67	8.45	8.76	8.08
	(1968)	6.87	7.79	8.36	8.11	8.09	7.82
India	(1967)	...	...	...	...	...	...
	(1968)	2.65	2.46	2.72	2.40	2.64	...
Japan	(1967)	97.5	95.9	110.4	108.8	112.7	114.7
	(1968)	110.0	114.1	125.4	121.4	119.2	119.2
Korea, Republic of	(1967)	4.93	4.40	5.09	4.94	4.96	4.71
	(1968)	3.97	3.40	4.69	4.97	4.97	4.79
Pakistan	(1967)	3.56	3.61	2.91	2.18	3.67	3.40
	(1968)	2.57	3.47	3.71	2.64	3.43	3.25
New Zealand	(1967)	-----	15.46	-----	-----	15.40	-----
	(1968)	-----	14.13	-----	-----	16.23	-----
SULPHURIC ACID (thousand metric tons)							
Australia	(1967)	189	166	197	180	174	153
	(1968)	166	167	158	173	166	128
China (Taiwan)	(1967)	17.1	13.9	15.6	14.9	14.1	15.2
	(1968)	16.6	15.2	14.4	14.3	14.2	13.9
India	(1967)	58.7	56.4	64.1	51.4	58.7	48.3
	(1968)	79.8	77.0	76.0	75.5	...	...
Japan	(1967)	523	480	530	513	517	487
	(1968)	574	537	558	537	532	535
Korea, Republic of	(1967)	2.05	2.04	1.99	1.75	2.15	2.30
	(1968)	2.93	0.08	2.25	3.13	3.37	2.71
Pakistan	(1967)	1.94	1.06	1.78	2.01	2.30	1.99
	(1968)	2.18	2.16	1.82	1.82	3.83	3.04
Philippines	(1967)	2.53	4.50	7.32	7.41	5.88	6.82
	(1968)	2.12	10.60	12.92	15.81	16.74	14.43
CAUSTIC SODA (thousand metric tons)							
Australia	(1967)	9.10	7.34	6.74	7.18	9.26	8.58
	(1968)	9.12	7.41	6.72	8.80	8.10	8.63
China (Taiwan)	(1967)	7.94	7.06	7.79	7.52	7.61	7.72
	(1968)	8.45	8.43	11.65	11.13	11.83	8.95
India	(1967)	19.4	18.2	20.4	17.2	20.0	20.2
	(1968)	24.6	24.3	25.3	20.6	24.5	...
Japan	(1967)	130	123	138	132	136	136
	(1968)	151	149	160	155	162	162
Korea, Republic of	(1967)	1.53	1.27	1.30	1.33	1.46	1.21
	(1968)	2.89	2.23	2.38	3.08	2.98	3.31
Pakistan	(1967)	1.58	1.32	1.19	1.77	1.82	1.67
	(1968)	2.29	1.79	2.17	2.24	2.20	1.77
Philippines	(1967)	0.88	0.91	0.72	0.59	0.41	0.96
	(1968)	0.60	0.84	0.92	0.83	0.86	0.81

Note: ^a Million metres.

Country and industry	Year	January	February	March	April	May	June
----------------------	------	---------	----------	-------	-------	-----	------

PLASTICS AND RESINS
(thousand metric tons)

Australia	(1967)	9.93	11.08	12.77	12.67	13.77	13.12
	(1968)	12.82	13.60	14.18	15.07	15.30	14.38
China (Taiwan)	(1967)	5.59	5.04	5.35	6.04	6.06	5.65
	(1968)	5.16	6.02	7.87	7.43	7.87	6.92
India	(1967)	3.20	3.06	3.64	2.61	2.94	3.04
	(1968)	4.30	5.13	4.72	2.96	...	...
Japan	(1967)	296	288	313	317	329	328
	(1968)	205	193	205	207	213	216
Philippines	(1967)	1.54	0.76	0.69	1.25	1.31	1.28
	(1968)	1.66	1.89	1.81	1.54	2.22	1.94

CEMENT
(thousand metric tons)

Australia	(1967)	225	294	312	314	359	218
	(1968)	243	317	334	300	353	320
China (Taiwan)	(1967)	287	267	290	276	289	273
	(1968)	346	286	346	316	360	274
Hong Kong	(1967)	19.3	1.3	14.7	24.8	1.8	1.7
	(1968)	25.8	33.3	34.5	33.6	38.6	33.0
India	(1967)	1,006	807	995	930	1,003	953
	(1968)	1,001	969	1,015	999	974	945
Japan	(1967)	2,937	3,232	3,745	3,216	3,362	3,476
	(1968)	3,225	3,618	4,329	3,839	3,779	3,700
Korea, Republic of	(1967)	218	161	214	231	265	197
	(1968)	130	146	205	332	364	347
Pakistan	(1967)	175	138	156	193	194	186
	(1968)	167	179	181	182	201	193
Philippines	(1967)	122.5	116.6	103.4	150.6	151.9	144.2
	(1968)	207.0	157.9	159.3	150.1	189.3	207.0
New Zealand	(1967)	48.7	69.5	73.7	74.3	81.9	64.8
	(1968)	50.5	70.1	67.2	57.6	69.9	60.5
Thailand	(1967)	119.2	107.7	167.5	149.0	148.0	135.8
	(1968)	146.4	161.1	182.1	171.1	...	...
Burma	(1967)	13.21	14.05	12.21	12.11	9.39	11.32
	(1968)	...	...	...	...	...	...
Ceylon	(1967)	6.40	8.12	11.74	11.85	13.69	13.81
	(1968)	...	...	...	...	...	...
Malaysia	(1967)	75.2	50.5	74.8	70.2	72.6	73.6
	(1968)	...	...	...	...	...	...

CRUDE STEEL
(thousand metric tons)

Australia	(1967)	516	462	531	469	562	539
	(1968)	530	524	565	586	551	523
China (Taiwan)	(1967)	33.8	31.1	37.7	37.5	39.3	39.6
	(1968)	43.0	43.4	46.0	42.3	41.6	39.5
India	(1967)	585	526	586	531	529	494
	(1968)	561	519	561	...	...	...
Japan	(1967)	4,839	4,582	5,140	4,943	5,212	5,256
	(1968)	5,411	5,233	5,540	5,356	5,517	5,456
Korea, Republic of	(1967)	20.5	19.5	30.5	25.9	25.8	26.8
	(1968)	21.0	18.0	27.5	30.3	28.7	29.5

CALENDAR OF ECAFE MEETINGS — INDUSTRY AND NATURAL RESOURCES 1969/70

Meetings scheduled for the period May 1969 – 1970

<i>Dates</i>	<i>Meeting</i>	<i>Venue</i>
<i>1969</i>		
5 – 12 May	Asian Standards Advisory Committee (second session)	Bangkok
13 – 27 May	Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (sixth session)	Bangkok
17 – 23 June	Working Party on Small-Scale Industries (ninth session)	Bangkok
30 June – 9 July	Advisory Committee on Regional Housing Centres (sixth session) and Sub-Committee on Housing, Building and Planning (ninth session)	Bangkok
16 – 23 Oct	Seminar on Mining Legislation and Administration	Manila
27 Oct – 10 Nov	Fourth Symposium on the Development of Petroleum Resources of Asia and the Far East	Canberra
16 – 23 Dec	Workshop on Promotion of Industrial Research (third session)	Bangkok
5 – 14 Jan	Advisory Council for Industrial Research (third session)	Bangkok
21 – 27 Jan	Asian Industrial Development Council	Bangkok
28 Jan – 4 Feb	Committee on Industry and Natural Resources (twenty-second session)	Bangkok

THE DEVELOPMENT ENQUIRY SERVICE

The Organisation for Economic Co-operation and Development has set up a Development Enquiry Service designed to provide, free of charge, information upon request, in various areas of economic development.

This assistance is available to public and semi-public bodies such as Ministries, National Banks, Productivity Agencies, Training and Research Institutes, etc. . . . It is not available to private firms, but Chambers of Commerce do qualify. The Service consists of:

- Supplying documentation, bibliographies, copies of articles and other relevant material to further the decision-making process in economic development;
- Indicating specialised institutions and experts;
- Supplying information on conferences, meetings, courses and seminars.

In carrying out its task the Service is assisted by a worldwide network of Correspondents, including International Organisations, Ministries in both industrialised and developing countries, Trade and Research Institutes, all of which have agreed to co-operate in this joint effort. This enables the Development Enquiry Service to send information collected from a variety of sources.

For further details, please write to:

DEVELOPMENT ENQUIRY SERVICE
O.E.C.D. Development Centre,
91, Boulevard Exelmans,
75. PARIS 16°. France.

HOW TO OBTAIN UNITED NATIONS PUBLICATIONS

United Nations publications may be obtained from bookstores and distributors throughout the world. Consult your bookstore or write to: United Nations, Sales Section, New York or Geneva.

COMMENT SE PROCURER LES PUBLICATIONS DES NATIONS UNIES

Les publications des Nations Unies sont en vente dans les librairies et les agences dépositaires du monde entier. Informez-vous auprès de votre librairie ou adressez-vous à: Nations Unies, Section des ventes, New York ou Genève.

COMO CONSEGUIR PUBLICACIONES DE LAS NACIONES UNIDAS

Las publicaciones de las Naciones Unidas están en venta en librerías y casas distribuidoras en todas partes del mundo. Consulte a su librero o diríjase a: Naciones Unidas, Sección de Ventas, Nueva York o Ginebra.