# THE REPUBLIC OF THE PHILIPPINES

# THE FACT FINDING STUDY REPORT
# ON
# THE INTEGRATED STEEL MILL PROJECT

February, 1976

JAPAN INTERNATIONAL COOPERATION AGENCY

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# PREFACE

The Government of Japan, at the request of the Government of the Republic of the Philippines, decided to undertake the sutdy for Fact Finding on the Philippine Integrated Steel Mill Project, and commissioned its task of implementation to the Japan International Cooperation Agency in August 1975.

Accordingly, the Agency organized a survey team consisting of ten experts headed by Mr. Yasuhisa Inada, General Manager of Economic Research Department of The Japan Iron and Steel Federation and sent it to the Philippines on 24 August, 1975.

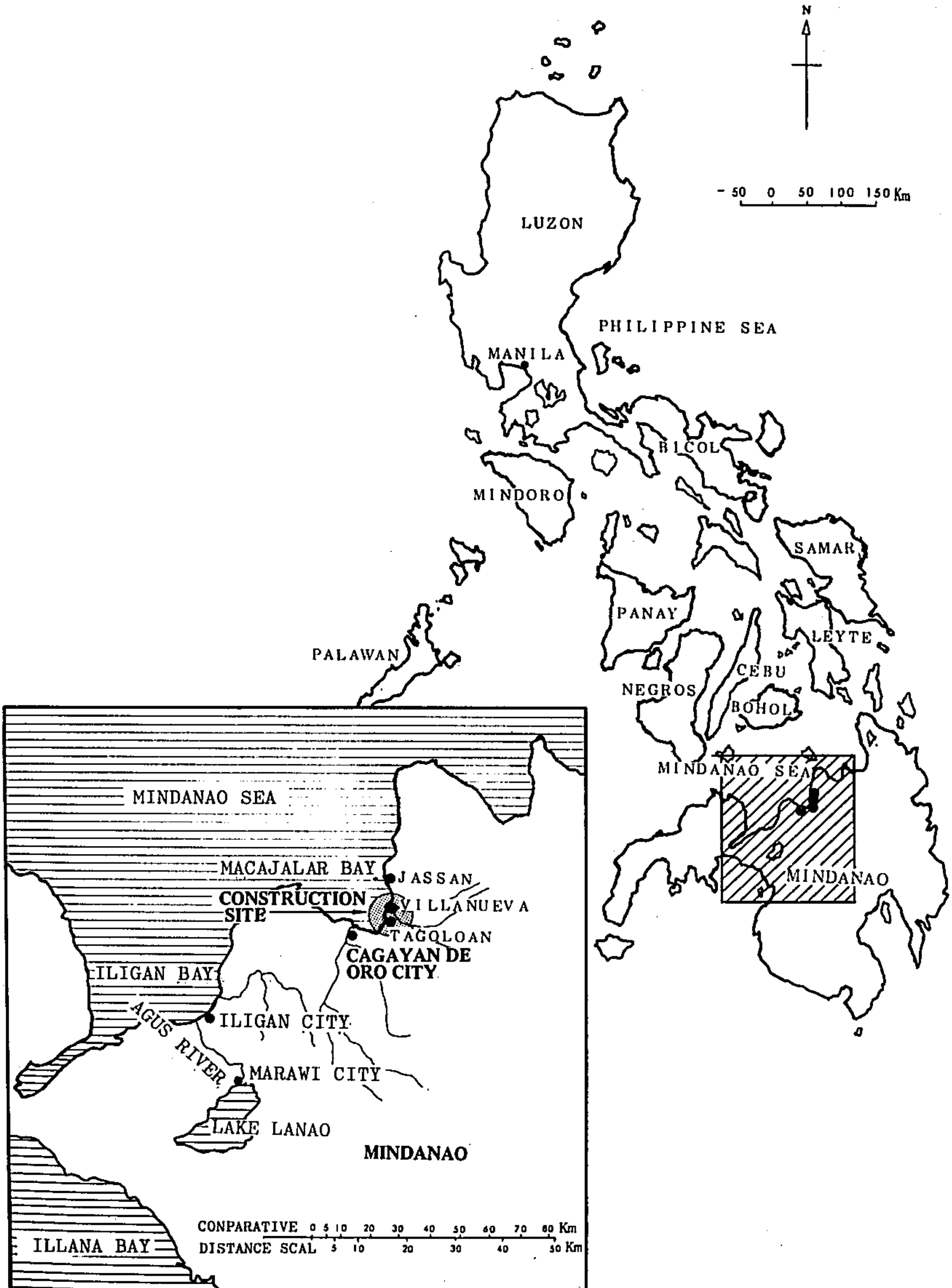
During the course of its 15-day visit to the Philippines, the team visited the Board of Investments, and through the courtesy of the Board exchanged views on the project with the Government officials and industry representatives concerned. It also conducted a field survey in the Greater Manila area and other cities in Mindanao with the cooperation of the authorities concerned.

Hereby presented is a report compiled by the team based upon the findings in the Philippines.

Nothing would be more gratifying to us than if this report could be of reference for the social and economic development in the Philippines and could contribute to the promotion *of friendship between the two nations.*

Finally, I wish to take this opportunity to express my hearty gratitude to the Government of the Republic of the Philippines and other authorities concerned for their kind cooperation and assistance extended to the team, without which the survey work could not have been carried out so successfully.

Shinsaku Hogen,
President
Japan International Cooperation Agency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MINDANAO SEA
MACAJALAR BAY
JASSAN
CONSTRUCTION SITE
VILLANUEVA
TAGOLOAN
CAGAYAN DE ORO CITY
ILIGAN BAY
AGUS RIVER
ILIGAN CITY
MARAWI CITY
LAKE LANAO
MINDANAO
CONPARATIVE 0 5 10 20 30 40 50 60 70 80 Km
DISTANCE SCAL 5 10 20 30 40 50 Km
ILLANA BAY

## CONTENSTS

* Of the fields covered by the Team, the subject of steel demand forecasting and of transportation of products, the Team, considering that the Philippine side would find the developments of the work which was in no small degree dotted with turns and twists much more useful than the results, has decided to compile all of the details of the discussions for presentation as reference materials as attached herewith.

# I. Introduction

1. The Japanese Government Fact Finding Team on Philippine Integrated Steel Mill Project, sent by the Japan International Cooperation Agency in accordance with a memorandum exchanged between the Government of Japan and the Government of the Philippines, visited the Philippines from August 24 through September 7, 1975. The objectives of the visit were:

1) To study the present situation and future prospects of the conditions surrounding the proposed integrated steel mill project in Mindanao, including a study of the steel policy of the Philippines, the organization to promote the project and the transport system;

2) To indentify the problems to be considered by the Philippine Government in connection with the construction and operation of the integrated steel mill.

While in the Philippines, the Team has exchanged views, on matters of mutual interest with government authorities and representatives of state and private corporations involved directly or indirectly in developing the steel industry and steel consuming industries. In addition, the Team toured Lanao del Norte and Misamis Oriental in Mindanao.

2. Members of the Team and Study assignments

| | | |
|---|---|---|
| Leader | MR. YASUHISA INADA<br>The Japan Iron and Steel Federation | (general) |
| Sub-leader | MR. SHIGEO SUZUKI<br>Ministry of International Trade and Industry | (general; steel policy) |
| Member | MR. HISAO SHIMIZU<br>Kawasaki Steel Corporation | (characteristics of site from standpoint of industrial location; infrastructure of integrated steel mill) |
| | MR. SHIRO OMORI<br>Kobe Steel Ltd. | (supporting industries) |
| | MR. YOSHIHIRO SATO<br>Nippon Kokan K.K. | (steel consuming industries; transport of products) |
| | MR. KAZUO SAKAKIBARA<br>Nippon Steel Corporation | (raw materials) |
| | MR. AKIRA INOUE<br>Sumitomo Metal Industries, Ltd. | (Steel consuming industries; transport of products) |
| | MR. YASUHIKO TAKASHI<br>The Japan Iron and Steel Federation | (procedures and organization for planning and implementation of steel mill construction) |
| | MR. SATOSHI KOBAYASHI<br>The Japan Iron and Steel Federation | (engineers and institutions for technical training) |
| | MR. TAKEO KUROKO<br>The Japan International Cooperation Agency | (coordination) |

3. Members of the Philippine technical counterpart group

| | |
|---|---|
| Head | DR. ANTONIO V. ARIZABAL (Policy Group)<br>Director, Metals & Mining Industries Department, Board of Investments<br>Executive Director, Metals Industry Research & Development Center |
| Members | MR. RUBEN GOMEZ (Policy Group)<br>Corporate Planning Manager<br>National Steel Corporation |
| | MISS MARILYN ALARILLA (marketing Group)<br>Marketing Research Manager<br>National Steel Corporation |
| | MR. NICANOR VILLASENOR (infrastructure Group)<br>Programs Director<br>(Elizalde Consolidated Steel Corporation)<br>Philippine Iron & Steel Institute |
| | MR. FRANCISCO TONG (Marketing Group)<br>(prsedent, Pag-Asa Steel Works)<br>Philippine Iron and Steel Institute |
| | MR. EDUARDO CHANCO (Raw Materials Group)<br>(Technical Consultant, Marcelo Steel Corporation)<br>Philippine Iron and Steel Institute |
| | MR. LAURO CRUZ (Infrastructure Group)<br>(President, Philippine Standards Association)<br>Philippine Iron and Steel Institute |
| | MR. FLORENTINO CUASAY (Marketing Group)<br>Asst. Manager, Industrial Economics Division<br>Metals Industry Research and Development Center |
| | MR. AGAPITO KALINGKING (Raw Materials Group)<br>Section Chief, Mining & Mineral Processing Section<br>Board of Investments |
| | MR. AVELINO GALVEZ (Infrastructure Group)<br>Supervising Mechanical System Engineer<br>Systems Development Division<br>Engineering & Construction Department<br>National Power Corporation |
| | COL. JUANITO DATOR (Infrastructure Group)<br>Deputy Administrator<br>PHIVIDEC Industrial Estate Authority |

MR. CECILIO SISON (Raw Materials Group)
Chief Metallurgist
Metallurgical & Laboratory Services
Bureau of Mines

ALTERNATES

MAJOR AMANDO DUMLAO, Jr. (Marketing Group)
for MR. FRANCISCO TONG
(Vice-President, Operations Super
Industrial Corporation)

MR. RAMON NAVARRO for MR. EDUARDO CHANCO
(Raw Materials Group)
(Plant Manager, Philippine Blooming Mills Co., Inc.)

MR. JOSE MABANTA for MR. LAURO CRUZ (Infrastructure Group)
(Asst. Vice-President, Metals Fabrication Division
Atlantic Gulf & Pacific Co. of Manila, Inc.)

MR. NESTOR SALANIO for MR. FLORENTINO CUASAY
(Marketing Group)
(Chief, Consultative Services Division)
Metals Industry Research and Development Center

4. Itinerary for the Japanese Government Fact Finding Team on Philippine Integrated Steel Mill Project

August 24, – Septmeber 7, 1975

| | | | |
|---|---|---|---|
| August | 24 (Sun.) | 14 : 00 | Arrive Manila |
| | 25 (Mon.) | 11 : 00 | Courtesy call on the Japanese Ambassador and briefing |
| | 26 (Tue.) | 9 : 00 | Preliminary meeting with the Philippine counterpart group |
| | | 10 : 30 | Courtesy visit to National Steel Crop. |
| | | 14 : 00 | First meeting with the Philippine counterpart group |
| | | 17 : 00 | Courtesy call on Honorable Vicente T. Paterno, Department of Industry |
| | 27 (Wed.) | 9 : 00 | Second meeting, in groups (policy; raw materials; market; infrastructure) |
| | 28 (Thu.) | morning | Transfer by air to Cagayan de Oro City in Mindanao |
| | | 13 : 00 | Visit Philippine Sinter Corporation |
| | | 16 : 00 | Visit Tagoloan-Villanueva Industrial Estate |
| | 29 (Fri.) | Morning | Transfer by car to Iligan City |
| | | 14 : 00 | Visit National Power Corporation |
| | | 15 : 00 | Visit Maria Christina Industries, Inc. |
| | | 61 : 40 | Visit National Steel Corporation |
| | 30 (Sat.) | | Transfer by air to Manila via Cebu City |
| | 31 (Sun.) | | Team meeting; study materials |

| | | | |
|---|---|---|---|
| September | 1 (Mon.) | 9 : 00 | Third meeting, in groups |
| | | 14 : 00 | Meeting with PHIVIDEC Industrial Estate Authority (policy and infrastructure groups)<br>Meeting with Bureau of Mines (raw materials group)<br>Meeting with Delta – DEAR (Division of Electronics, Airconditioning and Refrigeration) (market group) |
| | | 16 : 50 | Meeting with National Power Corporation (policy, raw materials and infrastructure groups) |
| | | 18 : 00 | Team meeting |
| | 2 (Tue.) | 9 : 00 | Visit Elizalde Consolidated Steel Corporation |
| | | 14 : 00 | Meeting with the Philippine Iron & Steel Institute (PISI) (policy group)<br>Meeting with the Board of Transportation (raw materials group)<br>Meeting with Chrysler Phils., Inc. (market and infrastructure groups) |
| | 3 (Wed.) | 8 : 00 | Visit Atlantic, Gulf & Pacific Co., (AG & P) (raw materials, market, infrastructure groups) |
| | | 9 : 30 | Visit Phil. Blooming Mills, Co. (raw materials and infrastructure groups) |
| | | 10 : 00 | Courtesy call on the Director General of the National Economic and Development Authority (NEDA) (policy group) |
| | | 11 : 20 | Visit International Pipe Industries, Inc. (IPI) (raw mateirals, market and infrastructure groups) |
| | | 11 : 30 | Courtesy visit to the National Science Development Board (NSDB) (policy group) |
| | | 14 : 00 | Visit Marsteel Corporation (market and infrastructure groups)<br>Visit FILMAG (raw materials group) |
| | 4 (Thu.) | 9 : 00 | Fourth meeting |

| | | |
|---|---|---|
| | 15 : 00 | Team meeting Interim Report compiled |
| 5 (Fri.) | 9 : 00 | Same as above |
| | 10 : 30 | Visit on Honorable Vicente T. Paterno, Department of Industry briefing on the Interim Report |
| | 14 : 30 | Team meeting |
| | 16 : 40 | Meeting with Japanese Embassy staff |
| 6 (Sat.) | 11 : 00 | Fifth meeting; presentation and explanation of the Interim Report |
| 7 (Sun.) | 13 : 10 | Leave Manila |

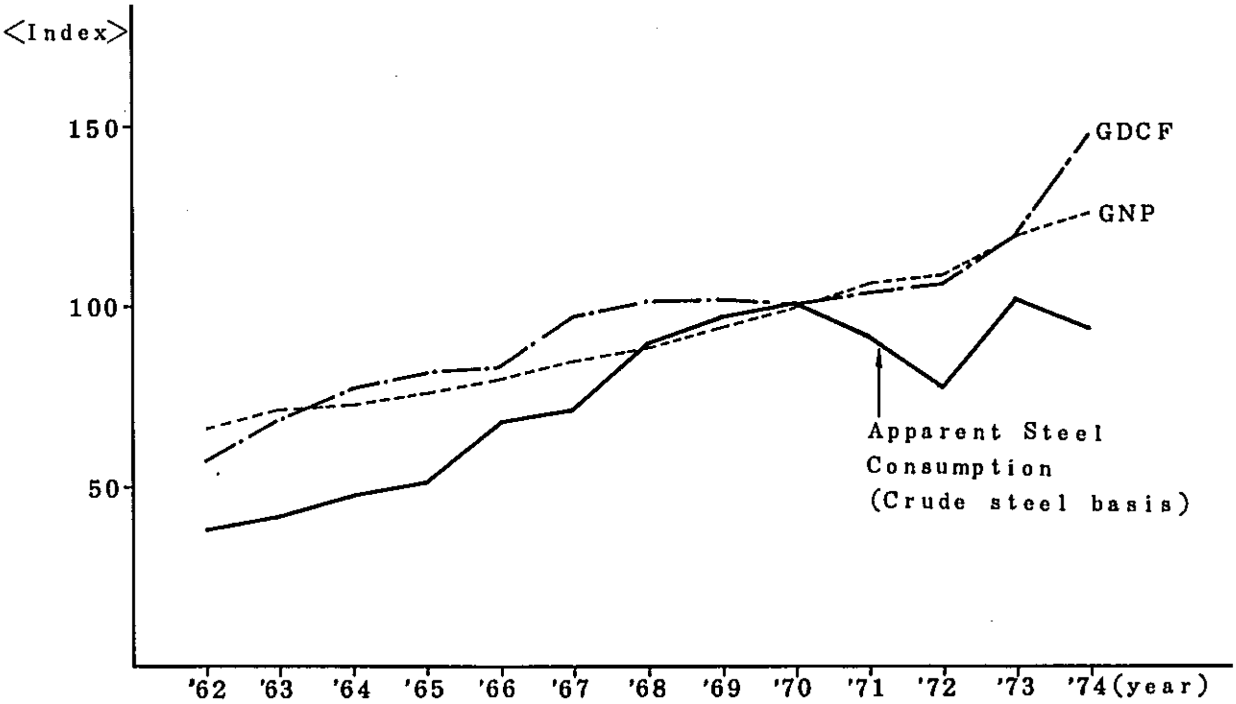
## II Current State of the Philippine Steel Industry

### 2-1 Steel Demand in the Philippines

1) Steel demand in the Philippines expanded markedly during the 1960s. However, it has been stagnant in the 1970s to date.

Apparent crude steel consumption (domestic demand) was a small 400,000 metric tons in 1962. It exceeded the 1 million ton mark in 1968 and showed a steady upward trend in 1969 and 1970. Steel consumption recorded an annual increase of 13.1 per cent from 1962 through 1970 on the average. In terms of the elasticity coefficient vis-a-vis the gross national

Diagram 1 Trends in apparent steel consumption, GNP and GDCF (Index 1970 = 100)




Data Sources: GNP, GDCF (NEDA)
Apparent steel consumption (Fact Finding Team, Market Group)

product during the same period, steel consumption, standing at 2.47, expanded at a pace far faster than that of the economic growth. In 1971, however, steel consumption slowed down, hovering around the 1 million ton mark. The average annual increase rate reversed from 1970 through 1974, registering minus 1.5 per cent, while the gross national product and the gross domestic capital formation marked an annual increase of 6.0 per cent and 10.3 per cent, respectively, during the same period. This is clear indication that steel consumption turned sluggish and declined. (Table 1, Diagram 1).

**Table 1 Trends in apparent steel consumption, GNP and GDCF**

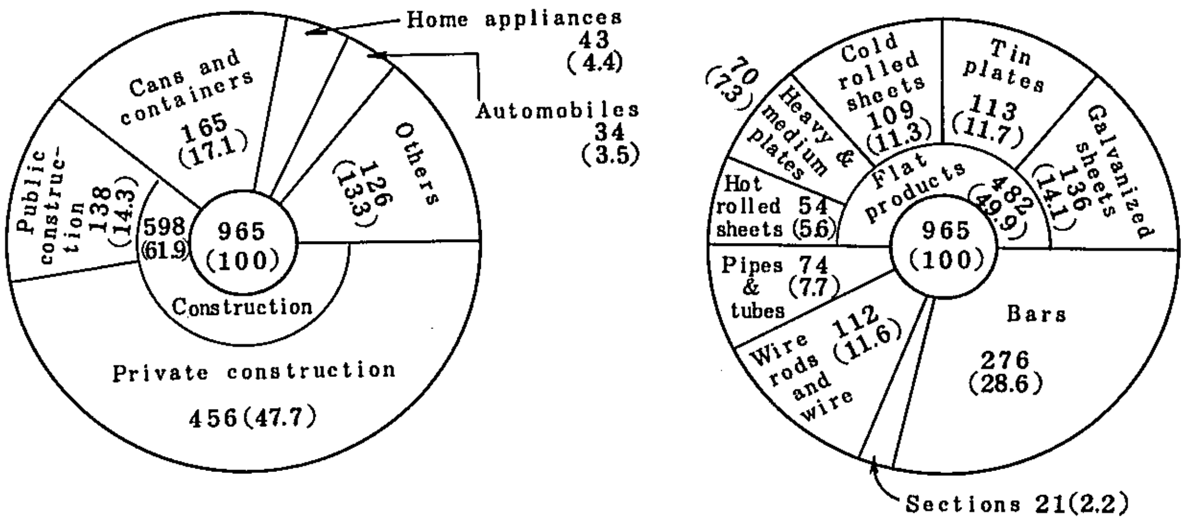
| year | Apparent Steel Consunption (1,000 MT) | GNP <'67 Prices> (Million Pesos) | GDCF <'67 Prices> (Million Pesos) |
|---|---|---|---|
| 1962 | 445.5 | 21,360 | 3,649 |
| 63 | 609.2 | 22,862 | 4,334 |
| 64 | 676.0 | 23,435 | 4,956 |
| 65 | 722.4 | 24,650 | 5,184 |
| 66 | 791.0 | 25,840 | 5,274 |
| 67 | 840.0 | 27,348 | 6,259 |
| 68 | 1,062.0 | 28,781 | 6,482 |
| 69 | 1,149.6 | 30,468 | 6,506 |
| 70 | 1,189.1 | 32,191 | 6,390 |
| 71 | 1,105.0 | 34,190 | 6,667 |
| 72 | 930.2 | 34,946 | 6,816 |
| 73 | 1,219.3 | 38,415 | 7,676 |
| 74 | 1,118.6 | 40,655 | 7,469 |

Sources: GNP, GDCF (NEDA)
Apparent steel consumption (Fact Finding team, Market Group)

2) Steel demand in the Philippines, from 1973 figures for steel consuming sectors, is characteristic in that construction forms 61.9 per cent and cans and containers 17.1 per cent of demand, and these 2 sectors account for nearly 80 per cent of the total steel consumption of 965,000 tons. Home appliances and automobiles stand at a small 4.4 per cent and 3.5 per cent, respectively. Reflecting these demand trends, steel bars lead consumption by products at 28.6 per cent, followed by galvanized sheets at 14.1 per cent, tin plates at 11.7 per cent, wire rods at 11.6 per cent, these 4 products accounting for 66 per cent of total consumption. (Diagram 2)

**Diagram 2 Steel demand by sectors and items (1973)**

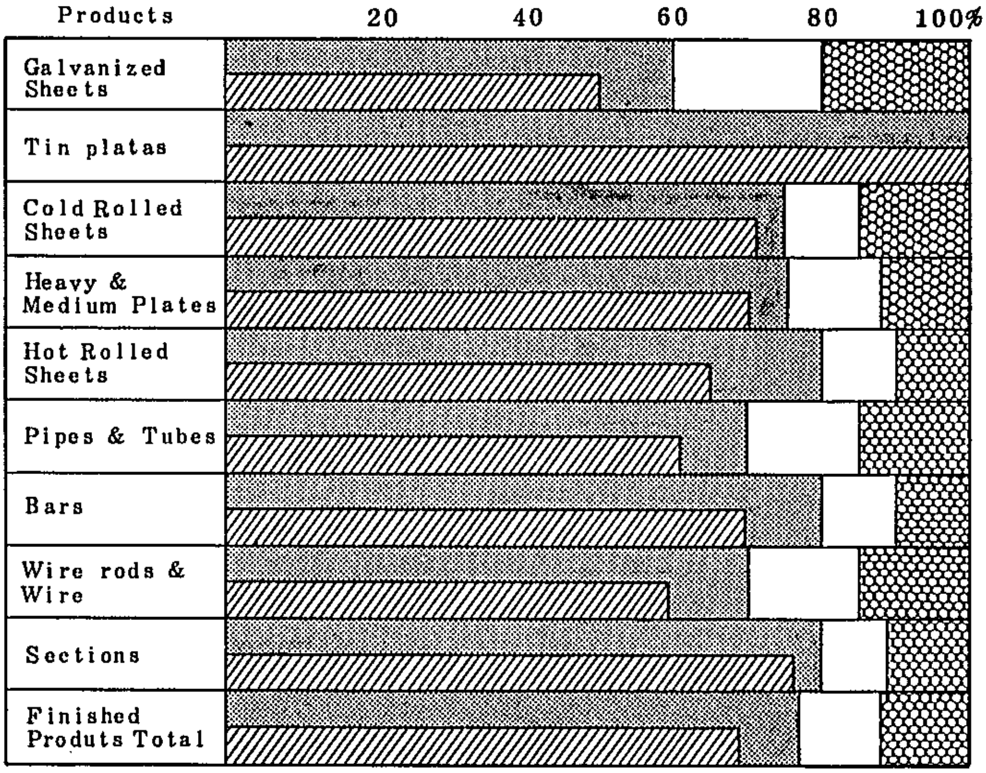
(Unit: 1,000 M.T: figures in parenthesis in percentage)



Steel demand in the Philippines characteristically centers on specific sectors or specific steel products. This is common in developing countries, except for the case of tin plates, of which consumption in the Philippines is high.

3) In terms of steel consumption by region, 77 per cent of the total steel consumption of 965,000 tons found outlets in the Luzon area, as of 1973. 90 per cent of this went to Greater Manila. The Mindanao and Visayas regions consumed only 12 per cent and 11 per cent, respectively. (Diagram 3)

**Diagram 3 Demand for steel products by regions**




Sources: Study on Distribution Study of Primary Iron & Steel Products, 1973 by Asia Research Organization, Inc.

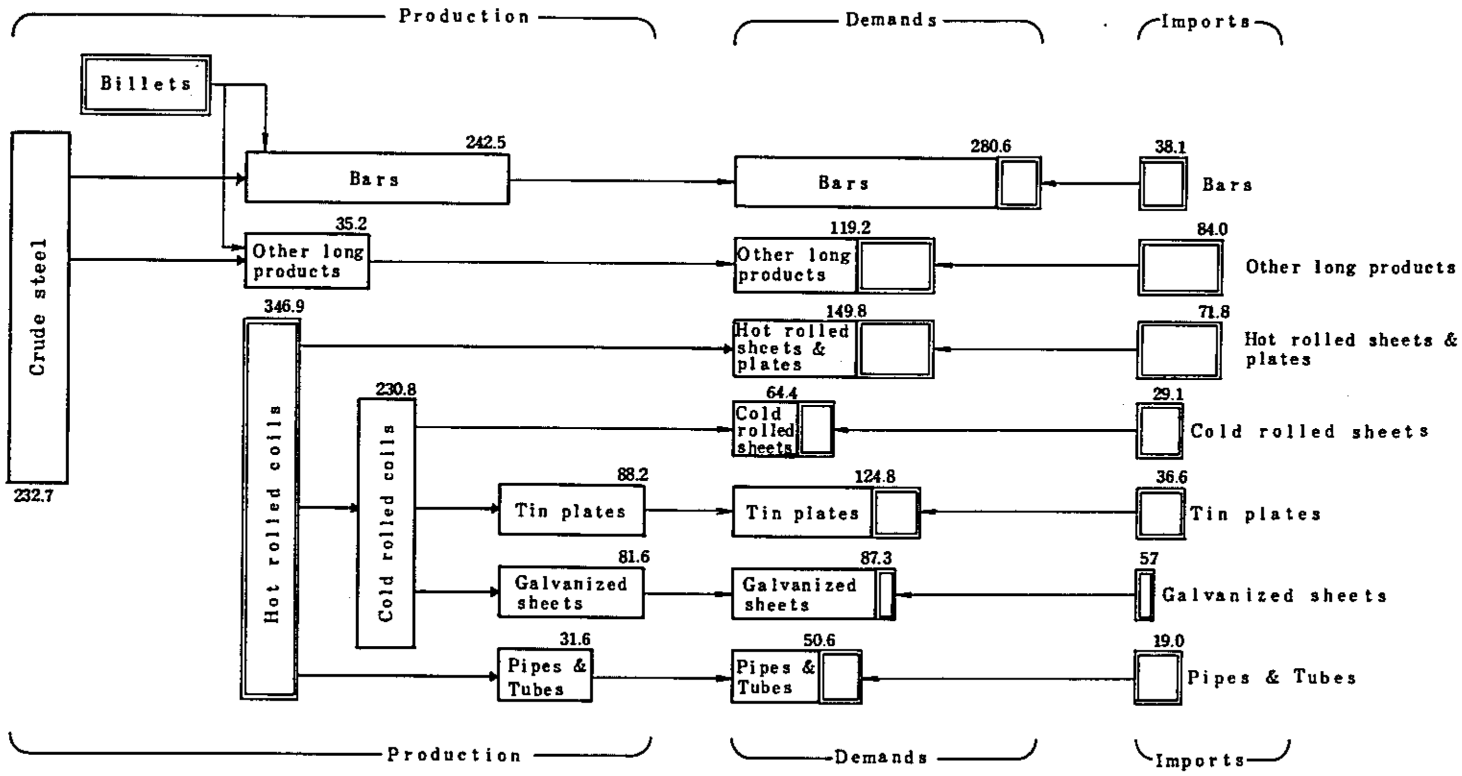
## 2-2 Demand and Supply of Steel in the Philippines

### 2–2–1 Steel Supply Flow

Domestic demand of long products was 400,000 tons in 1974, (steel bars 281,000 tons, wire rods 79,000 tons and sections 40,000 tons), while domestic production of these items totaled 278,000 tons (243,000 tons of steel bars and 35,000 tons of wire rods). Blooms and billets were mostly supplied by domestic production from the electric furnace steel making process, which stood at 233,000 tons in 1974. The remainder was met by imports. Also, each type of long products relied on overseas suppliers to meet the domestic demand for finished products. In 1974 the share of imports for each item (imports/domestic demand) was 100 per cent for sections, 55.5 per cent for wire rods and 13.6 per cent for steel bars, respectively.

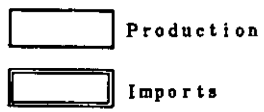
As for flat products, the total requirements of 347,000 tons was met by overseas suppliers in 1974 in the absence of domestic production of hot rolled coils. Most imported hot rolled coils and sheets (77 per cent in 1974) were earmarked for further processing, for example, the manufacture of cold rolled coils or sheets and pipes. The rest was delivered as hot rolled sheets after shearing/slitting. Cold rolled coils and sheets were supplied from domestic production utilizing imported hot rolled coils (231,000 tons in 1974) and the imports share was small (29,000 tons in 1974). Of cold rolled coils, 75 per cent (196,000 tons) was consumed for further processing purposes, such as for the manufacture of galvanized sheets and tin plates, and the rest (64,000 tons) was delivered as cold rolled sheets. The demand for galvanized sheets and tin plates (87,000 tons and 125,000 tons, respectively, in 1974) was mostly met by domestic production (82,000 tons and 88,000 tons, respectively, in 1974), with the result that the share of imports stood at 6.5 per cent and 29.3 per cent, respectively. Diagram 4 shows supply flow of these products.

## Diagram 4 Flow of steel supply in the Philippines




Notes: 1974 figures (unit: 1,000 MT)

Source : Figures of production (MIRDC)



2–2–2 Operating Rate

Table 2 summarizes steel making facilities installed and in operation in the Philippines. As noted in the table, the rate of operation of tinning lines stands fairly high at 72.8 per cent of capacity, while the rate for others is extremely low, failing to reach the break even point.

The low rate of operation is generally due to the restrictions on the availability of low cost materials, such as steel scrap and semi-finished products, and to technological limitation in operating. Rolling mills, in particular, which are for the manufacture of finished products, have excessive capacity, compared with present scale of domestic demand. In 1974 the bar mills were operating at 24.4 per cent capacity. The rate is low, producing 251,000 tons. Nevertheless, this volume is sufficient to cover the major part of domestic demand which stands at 281,000 tons.

**Table 2 Steel making equipment and facilities (1974)**

| Equipment and Facilities | | Shops | Units | Annual Capacity (MT/y) | Production (MT/y) | Rate of Operation (%) |
|---|---|---|---|---|---|---|
| Steel Making | Electric Furnaces | 10 | 18 | 441,800 | 232,724 | 52.7 |
| | Open Hearthes | 1 | 2 | | | |
| | Total | 10 | | | | |
| Hot Rolled Mills | Bar Mills | 27 | 29 | 1,027,520 | 250,938 | 24.4 |
| | Wire Rod Mills | 5 | 5 | 187,880 | 33,986 | 18.1 |
| | Steckel Mills | 1 | 1 | 300,000 | out of operation | … |
| Cold Rolled Mills ※ | | 3 | 3 | 450,000 | 19,684 | 4.4 |
| Surface Treatment | Tining Line ※※ | 1 | 1 | 110,000 | 80,068 | 72.8 |
| | Galvanizing lines | 9 | 10 | 394,850 | 87,710 | 22.2 |
| Pipes & Tubes Mills | | 5 | 5 | 129,523 | 32,314 | 24.9 |

Sources: MIRDC Materials

Notes: ※ : Cold rolled products for further processing not included in production, the rate of operation appears extremely low compared with reality.

※※ : Production unit being transferred from NSC's Iligan Mill to Elizalde not counted.

2–2–3 Market Price

The following are trends in the market price of steel bars and galvanized sheets, for which major items the demand is great:

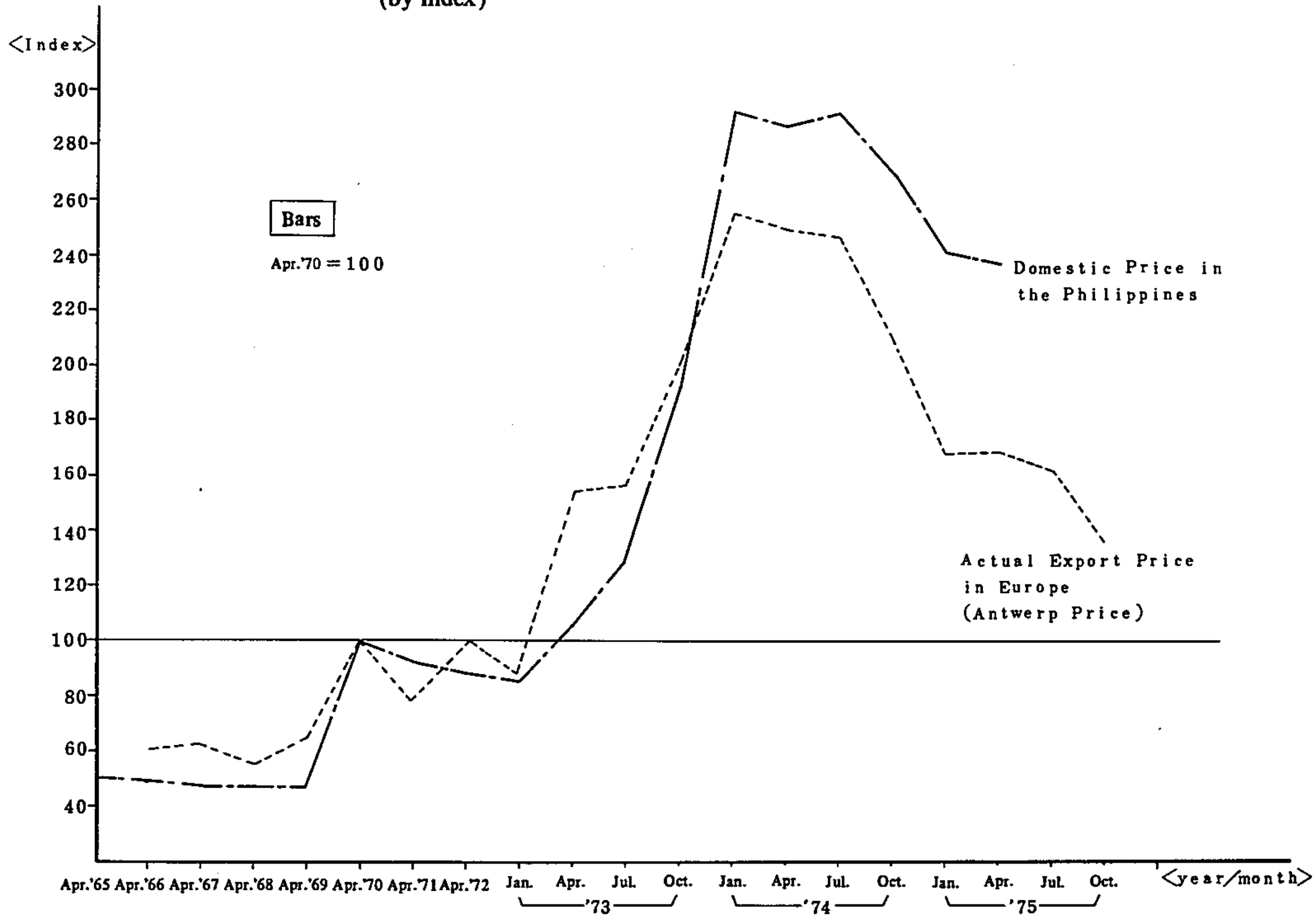
The price of steel bars rose noticeably in the latter half of 1973, reflecting trends in the world market at that time. The world market declined sharply in the latter half of 1974, but the price in the Philippine market did not drop proportionally. The same trend is noted in the price of galvanized sheets. The price in the world market of hot rolled coils, from which galvanized sheets are produced, showed a sharp downward curve in early 1975. Imports by the Philippines of hot rolled coils marked a steep drop then, compared with the tight demand and supply situation that preceded. This will partly explain why there can be such a difference between the price of galvanized sheets on the world market and that in the market in the Philippines. (Diagram 5)

## 2-3 Steel Policy in the Philippines

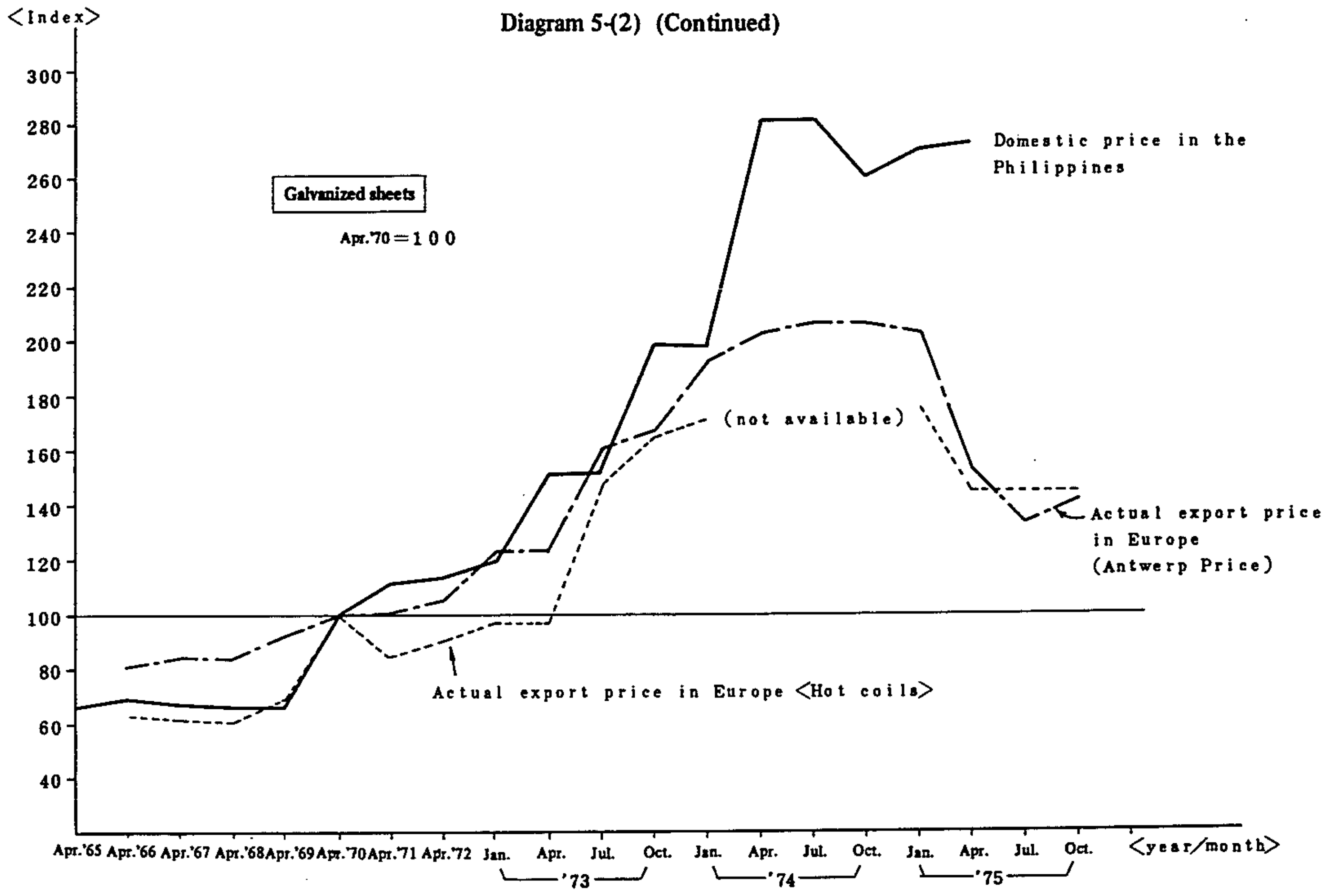
1) To promote economic development through balanced industrialization, the Philippine government provides businesses with incentives through the intermediary of the Board of Investments. These incentives are made available in accordance with the Investment Incentives Act and the Export Incentives Act. To serve as a guideline for the entrepreneurs, the Board of Investments announces priority investment programs each year (8th as of 1974; Table 3) and priority export programs (6th as of 1974). Capital investments in the Philippines by overseas businesses are subjected to the Foreign Business Regulation Act, which regulates the shares of foreign capital.

Diagram 5-(1) Trends in domestic price in the Philippines and actual export price in Europe

(by index)



## Diagram 5-(2) (Continued)




Source: Domestic price in the Philippines (Central Bank)
Actual export price in Europe (Metal Bullein)

## Table. 3 Steel Related Priority Investment Programs

| | 3rd Plan (1970) | 4th Plan (1971) | 5th Plan (1972) | 6th Plan (1973) | 7th Plan (1974) | 8th Plan (1975) |
|---|---|---|---|---|---|---|
| 1) Primary steel (P) Integrated steel mill(including slabs blooms and billets | MC: 2million MT (Local) | | | MC: 1million MT (Local) | MC: 1.5million MT (Local) ··· (exports) | |
| 2) Ferro-alloys (P) | MC: 21.700MT (Local) 40.000MT (export ferrosilicon) 20.000MT (export ferrochrome) Of local MC 15.000 MT for use at integrated steel works | | One project needed to fill gap in demand and supply of ferrosilicon | MC: 2.300MT (Local) ··· (exports) | | |
| 3) Special & Alloy steel (P) | MC: 9.100MT (Local) | | ⓐ Ingots MC: 12.160 MT (Local) ⓑ Castings MC | | MC: 15.910MT | |
| 4) High-Carbon steel wire (P) | MC: 14.900MT (Local) | | MC: 17.150MT (Local) | | MC: 18.100MT (Local) | |
| 5) API Pipes(NP) | MC: 13.500MT (Local) | | | | | |
| 6) Pig Iron (P) | | | | | MC: 70.000MT (Local) | |

(Note): MC (Measured Capacity) = annual demand – production capacity of existing steel makers
P (Pioneer Status)
NP (Non Pioneer Status)

(Source): Investment Priorities Plan (Board of Investments)

2) Recognizing the importance of the steel policy, in 1973 the Philippine government created under Presidential Decree No.272 the Iron and Steel Authority, the top decision–making body for all steel policy in the Philippines. The Authority is made up of 6 representatives of government agencies (Secretaries of Industry, Finance, National Defense, and Trade, and Governors of the Central Bank and the Development Bank), and 2 representatives from the private sector (yet to be appointed). The ISA meets about once a month. It is currently chaired by His Excellency Mr. Paterno, the Secretary of Industry.

One of the notable decisions of the organization concerns control on the expansion of production capacity, adopted as a measure to streamline the steel industry by gearing down or by eliminating the growing trend of over installation of production facilities. As mentioned earlier, there are too many steel making facilities at present in the Philippines. So imports of equipment and machinery are subject to approval so as not to stimulate the tendency any further. The mechanism is working effectively.

The ISA is also involved in pricing problems. To protect steel users from price spirals in the domestic market as what happened in 1974, the agency set ceiling prices for 4 items, such as concrete bars, tin plates, galvanized sheets and nails, irrespective of whether they are imported or produced domestically.

Measures are also being considred to assure stable imports of semifinished products. The National Steel Corporation has been recently empowered, as a representative of users of semi-finished products, to handle imports of semi-finished products. The utilization of this measure, however, is left to the option of the users of semi-finished products. This measure is considred a temporary one.

Another notable decision by the ISA includes transplantation of Tinning lines. The facilities at the former Iligan Steel Mill in Mindanao are being moved to Elizalde in Manila, to be completed by the end of 1975. This decision was made in view of the fact that the demand for tin plates centers on Manila and its neighboring communities and that the concentration of tinning lines in the region would be beneficial in terms of cost.

Yet another function of the ISA is the collection of information. Under Presidential Decree No.272 issued in 1973, the ISA is collecting statistics and information to compile statistics on purchases of raw materials.

3) Turning to the present level of tariffs on imported steel products, 75 per cent duties are imposed on galvanized sheets, 50 per cent on tin plates and steel bars, 30 per cent on cold rolled sheets and low grade wire rods since these items are in competition with domestic products. For those items which do not compete with domestic products, 10 per cent duties are collected. The import tariffs are set by the Tariff Commission under the jurisdiction of the Department of Trade.

## III Present State of the Integrated Steel Mill Project

### 3-1 Outlines of the Project

1) Efforts to construct an integrated steel mill in the Philippines dates back to Republic Act No.1395 enacted in 1955. The facilities of the old Iligan Integrated Steel Mills, Inc., presently operated by the National Steel Corporation, were installed along these lines. Electric furnaces, rolling mills, such as a bar and rod mill, a blooming mill, a billet and bloom mill, a reversing hot strip mill and a cold 4-high tandem mill were installed and operated. Nonetheless, integration by blast furnaces and converters was not achieved.

Enthusiasm for domestic production of steel was intensified by recent economic development in the Philippines, and was translated into a tangible move in the 1970s. The Philippine government made positive requests for surveys on the construction of an integrated steel mill to ATKINS in 1971 and Nippon Steel Corporation in 1973. Using the results of these surveys and guided by the judgement of the Philippine government authorities concerned, it was decided to build a state-run integrated steel mill in Mindanao.

At the same time, the Philippine Government, as a member country of the ASEAN, hopes much that the proposed integrated steel mill project will grow into a joint project among the member nations of the ASEAN and that it will serve to promote regional cooperation.

2) The Mindanao project aims at: a) eliminating the limited raw materials structure, dependent on such items as steel scrap and imported semifinished products and steel products of which prices and quantities are unstable; b) providing a basis for the development of steel consuming industries by establishing a setup which will guarantee a stable supply of steel and steel products; c) creating a new pole of industrial growth in Mindanao; and d) stabilizing of demand and supply of steel in the countries in the region.

3) The Tagoloan-Villanueva area was chosen as the location for the proposed steel mill for the following reasons: a) It is possible that hydroelectric power generation capacity in Mindanao will be greatly increased by the utilization of the Agus River which has an abundant water flow. b) A large, flat area of land (3,000 ha) can be acquired at a low cost. The soil is also considered to be fairly tenacious. c) The site is on Macajalar Bay, convenient for berthing large vessels. d) The site is off the path of typhoons. e) It is close to Iligan City, a leading urban center in the Philippines, where a plant of the National Steel Corporation is located. f) It is right next to the sintering plant being constructed by the Philippine Sinter Corporation.

The PHIVIDEC Industrial Estate Authority was created under Presidential Decree No.538 issued in 1974 to develop industries in Mindanao. As a major project, the Authority is scheduled to undertake land reclamation for a large scale industrial complex encompassing large, medium and small businesses, as well as for an urban community. It is currently acquiring 3,000 ha of land for the purpose. In addition, a sintering plant of the Philippine Sinter Corporation is under construction in the area scheduled for completion at the end of 1976.

4) The scale of the proposed steel mill as planned by the Philippine side is 2 million tons on a crude steel basis for the first phase, and 4 million tons for the second. Equipment and facilities required and the production process employed are given, though still tentative, in Table 4 and Diagram 6 and 7.

## Table 4 Specifications of Integrated Steel Mill Equipment

| | 1st Stage (2million MT) | 2nd Stage (4million MT) |
|---|---|---|
| Blast Farnace | 1 unit (3,000m³) | +1 unit (3,000m³) |
| L D Converters | 2 units (200t/ch)<br>< ½ unit Operated > | +1 unit (200t/ch)<br>< ⅔ units Operated > |
| Continuous Casting Machines | 6 strands for Blooms, 2 units<br>Products sizes:<br>250×250 or 200×300(ave.)<br>350×400(Max) | |
| | 2 strands for slabs, 1 unit<br>Products sizes:<br>100, 200, 250, 300×630 to<br>1,550×6,100 to 11,000 | +1 unit |
| Billets/Medium Sized Section Mill | 1 unit<br>Products sizes:<br>100×100, 80×80, 60×60 : Billets<br>60 to 120 : Round bars<br>75×75 to 150×150 : Angles<br>100×50 to 150×75 : Channels | |
| Bar & Wirerods Mill | 1 unit<br>Products sizes<br>5.5 to 13φ : Wire<br>12 to 50φ : Bars | At the scond stage, wirerods will be mainly produced. |
| Small Sized Bar Mill | | 1 unit<br>Products sizes:<br>12 to 60 : Round bars<br>80(Max) : Angles & Channels<br>130(Max) : Flat |
| Hot Strip Mill | | 1 unit (5 strands semi continuous)<br>Products sizes:<br>1.2 to 2×630 to 1,550<br>Rolling speed: 950m/min |
| Utilities (Electric Power)<br>Peak time demand:<br>In plant power generation:<br>Supply from NPC : | <br><br>50,000KW<br>40,400KW<br>9,600KW | <br><br>156,000KW<br>115,000KW<br>41,000KW |

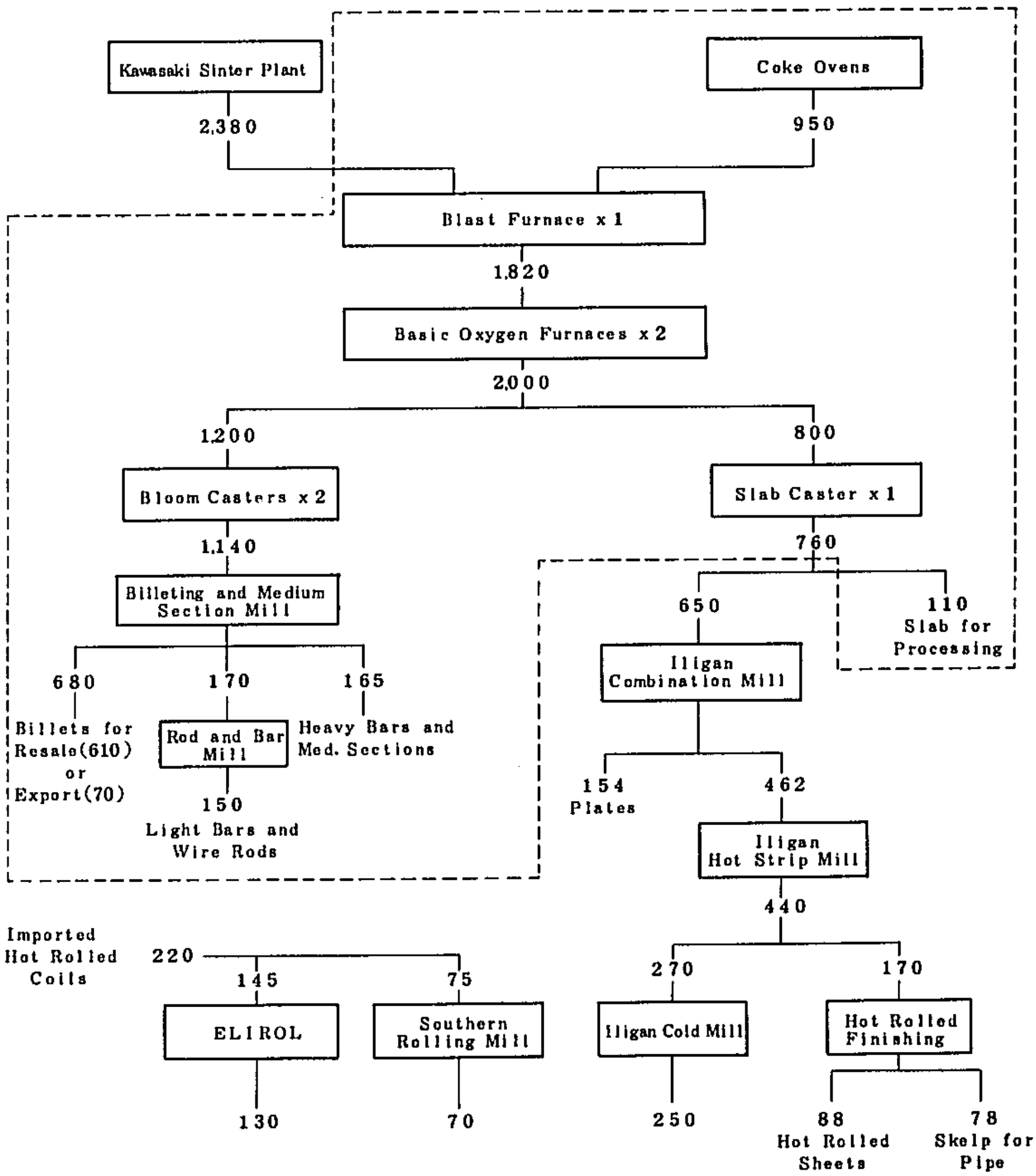
Note: All sizes in mm

Source: (1) The Proposed Philippine Integrated Steel Mill (Nov. 1974)

(2) Report on Reconnaissance/Preliminary Survey and Study for the Proposed Integtated Steel Plant of the National Steel Corporation.

**Diagram 6 Integrated Plant Process Flow: First Stage 2 Million Metric Tons**

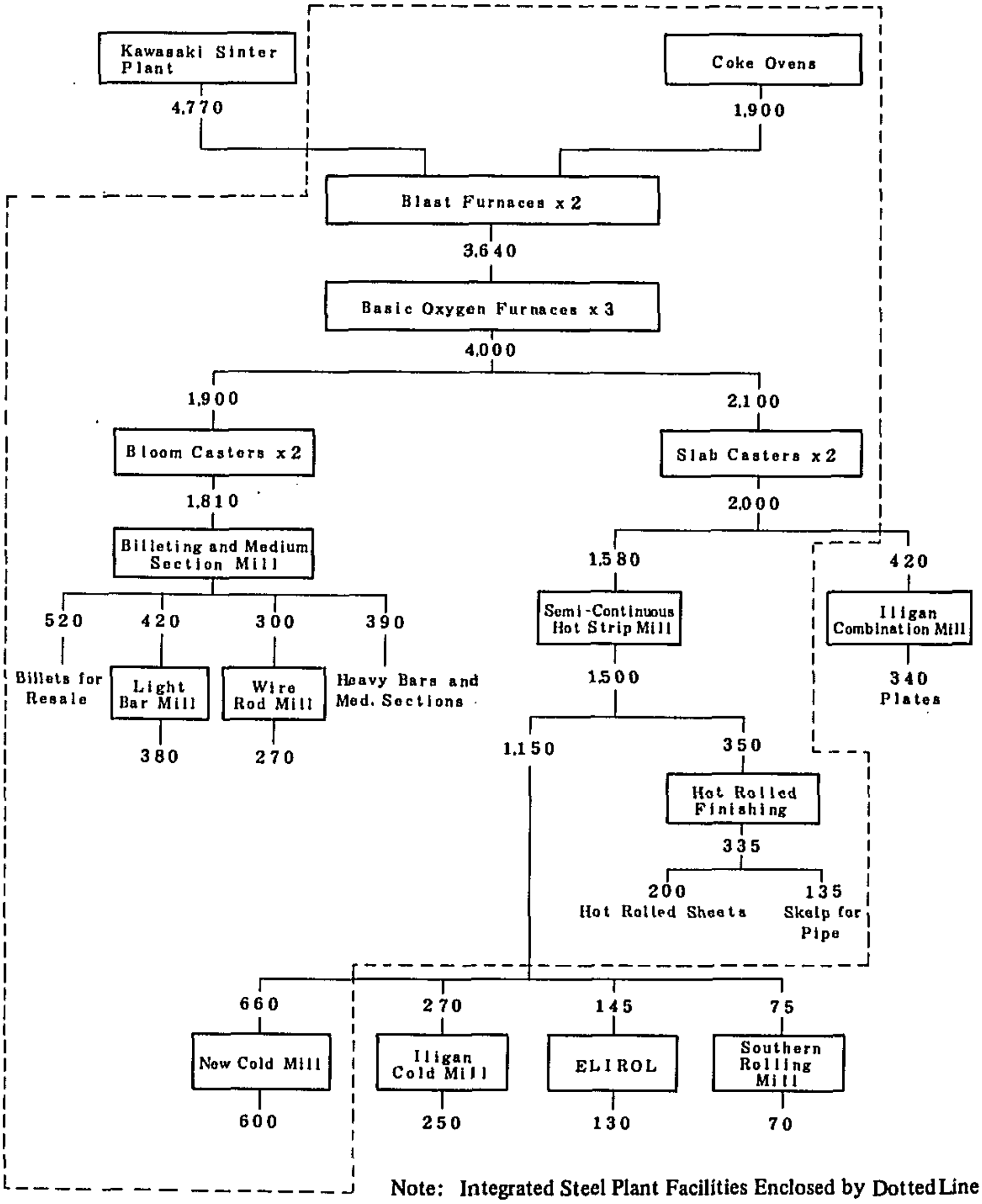
**(Capacity Figures in 000 T/Yr.)**




Note: Integrated steel plant facilities enclosed by dotted line.

Source: The Proposed Pilippine Integrated Steel Mill (Nov. 1974)

Diagram 7 **Integrated Plant Process Flow: second stage 4 Million Metric Tons (Capacity Figures in 000 T/Yr.)**




Note: Integrated Steel Plant Facilities Enclosed by Dotted Line

Source: Same as Diagram 6

A body charged with concrete planning and promotion of integrated steel mill project has yet to be formed. The Philippine government is expected to organize such a body for the implementation of the project on the outcome of feasibility studies to be undertaken in the days ahead. It is also understood that the Philippine side will organize working groups joined by consultants from the private sector and, if necessary, have them substitute the the task forces.

Regarding raising of capital for the construction of the proposed integrated steel mill, the government will provide 100 per cent at the initial stage and participation of private interests will be considered when profitability approaches. As for the borrowing of construction funds, multinational financing is being considered within an 18 per cent debt ratio.

The project schedule is first to undertake the final feasibility study, procure capital based on the outcome of the study, and start first phase construction in 1977 for operation in 1980.

The following are the observations and comments on each related aspect for the proposed integrated steel mill project. As for demand forecasts and products transportation, the Team has judged it appropriate, on the basis of the results currently available of the analyses made by the Philippine side, to refer to forecasting methods, and, accordingly, attached, in the appendix, as reference materials, together with a variety of background data.

### 3-2 Raw Materials

1) Of major materials required for operation of an integrated steel plant in the philippines, iron sand, part of iron ore, and limestone are currently locally available. Not much coking coal is expected.

Iron sand reserves are said to stand at 48.6 million tons and in fact, 1.5 million tons of iron sand are produced for export (1972). However, because of the composition of iron sand, the volume for use in the blast furnace will probably be extremely small.

Reserves of iron ore (lump ore) are estimated to be 102 million tons. However, deposits are generally small and low grade (Fe 42.36 per cent). Then, the use of these lump ore into blast furnaces will be restricted. In mining copper ore, very pure and granular magnetite is obtained as a byproduct. Economic utilization of this product depends on location and volume of production. In this case, utilizing it in the blast furnaces is not considered at present.

Reserves of limestone are estimated at 4,583 million tons. The Philippine Sinter Corporation is now developing this on the island of Bohol. There will probably be not much of a problem as far as the volume of this material is concerned.

Coal reserves are estimated at 125 million tons or thereabout. The major part, however, are bituminous coal or semi-bituminous coal and not much can be expected for metallurgical use.

2) Thus, the Philippine government will rely wholly on the imports of iron ore and coking coal for the start of operation in the proposed integrated steel mill, while it intends to explore and develop domestic iron ore, so as to improve the share of domestic raw materials in the years ahead. The way of thinking on the part of the Philippine government is basically welcome in view of the international situation surrounding natural resources.

3) As for the import of major raw materials, the Philippine government has in mind Australia and Brazil as sources of iron ore supply and Australia as a supplier of coking coal. An optimistic view is that there will not be much difficulty in importing these materials as long as no attempt is made to own mines themselves at the sources. Collection of informtion, study or survey on overseas resources are yet to be conducted.

4) The integrated steel mill which the Philippine government is planning to build will not be located where raw materials are available, but will depend fully on the import of

major raw materials for the time being. This dependence on imported raw materials will not change, in terms of structure, the basic setup of the supply of raw materials to the Philippine steel industry. To be frank, the industry will foresee problems much more difficult than in the past.

A possible problem will accompany the introduction of a pig iron production process. Blast furnaces, related facilities, raw materials beneficiation facilities, etc. are complex and also require a high operating rate. It is therefore indispensable to assure a regular and stable supply of raw materials.

Secondly, raw materials to be charged in the blast furnace are minerals which differ from naturally produced scrap or industrially produced hot coils or slabs which are readily available in the market. They can only be obtained when users themselves take the trouble to make time consuming and aggresive surveys and efforts for development. It is often the case that users themselves shoulder development funds.

In the third place, the introduction of pig iron production requiring huge quantities of raw materials will be of an greater burden with regard to handling, such as transport, loading and unloading.

5) The problems concerning raw materials are enphasized, as a stable supply of quality raw materials is vital for the operation of an integrated steel mill. It is therefore suggested that progressive surveys and studies be made of all the problems involving raw materials acquistition and supply. As a first step, it is recommended that a study be made of the situation overseas not only in raw materials producing countries but also in consuming countries.

### 3-3 Requirements for Location and Infrastructure

1) The Philippine government is planning to locate the proposed integrated steel mill in the Tagoloan-Villanueva area in northern Mindanao. It's land area is approximately 3,000

ha. It will be a big industrial complex with integrated industrial and community facilities. Approximately, 10 heavy, 40 medium and 100 small-scale industries are planned to be accommondated around the proposed steel mill.

The area is fan-shaped, based on accumulated sand, that covered the layers of coral reefs. Sand brought down by the Tagoloan River, which originates from an extensively mountainous area behind ranging from 600 to 1,000 meters above the sea level.

At the moment, the area is carpeted with coconut trees, and the inhabitants live by agriculture or fishing. A sintering plant of the Philippine Sinter Corporation and its adjoining sea berths are presently under construction at the eastern tip of the area. A high-way linking Iligan with Cagayan De Oro and Butuan runs about 2.5 km inland from the seashore. Work is under way for the widening and rerouting it as a national highway with financial assistance from the Asian Development Bank. When completed in 1977, traffic will improve significantly.

Urban communities in the neighbourhood include Cagayan De Oro, located about 20 km southwest with a population of about 130,000, and Iligan, about 100 km in the same direction, with about 100,000 residents, an industrial center of Mindanao, featuring a steel mill of the National Steel Corporation, a ferroalloy plant of the Maria Christina Chemical Industries, Inc., the National Power Corporations's Maria Christina hydroelectric power station on the Agus River and the Iligan Institute of Technology, etc.

2) There are advantages in the natural environment around the site as cited by the Philippine government. As far as meteorological considerations are concerned, the area is out of the path of typhoons, and there are few strong winds with a wind-force scale of 6 or more which is extremely small from a statistical standpoint. Such being the case, the sea is calm 70 per cent of the year, and the use of port and harbor facilities is almost immune from meteorological worries.

As for geological consideration, the ground is of alluvial soil, and judging from data obtained by surveys conducted at and around the site of construction of the Philippine Sinter Corporation's sintering plant, the soil seems favorable and fairly tenacious. As is well known to the Philippine authorities, the area was formed by the encroachment and accumulation of the Tagoloan River, so that the geological structure varies from one place to another. It is therefore imperative that the nature of the soil be thoroughly examined prior to construction works, so as to allocate large and heavy structures properly.

The coast line, except for the coral reefs, is fairly suitable for the construction of berths for huge vessels, since the water is over 7 meters deep and the inclined plane is also very steep.

The Tagoloan River water has an average capacity of about 2,500 million tons a year, permitting ample use for industrial water. Judging from the data supplied by the Philippine government, the quality of the water is fully satisfactory for industrial use. (Table 5)

3) As far as infrastructure needed for the construction and operation of the proposed integrated steel mill are concerned the attention of the Philippine government is invited with respect to electric power as a top priority item.

There are two problems to be considered and they are inter related. One of them concerns an advanced inducement to power consuming industries. As is well recognized by the Philippine authorities concerned, the present power generating capacity in Mindanao is not sufficient to supply the integrated steel mill, to run the hot strip mill in particular. Thus, the National Power Corporation is promoting electric power development on the Agus River under a very aggressive scheme designed to provide ample back-up power for the steel mill. (Diagram 8 and Table 6) Also, from the stand point of preventing the occurance of flicker, power consumption by establishments other than the integrated steel mill will have to be for larger than that by the steel mill.

**Table 5 TAGOLOAN RIVER Water Analysis (N S C materials)**

JAN. 1975

| Subjects | TAGOLOAN. R. | PHILIPPINE standards | JWWA (Japanese standards) |
|---|---|---|---|
| PH range | 7.5 | 6.5~8.5 | 5.8~8.6 |
| Taste | none | none | Not to be abnormal |
| Color | 5.0 | 0~20 | 5 degrees or less |
| Odor | none | none | Not to be abnormal |
| Turbidity | 2.25 | 0~10 | 2 degrees or less |
| Alkalinity | 118 PPM | — | >5 PPM |
| Bicarbonate | 143.96 | — | — |
| Acidity | none | — | — |
| Free $CO_2$ | none | — | — |
| Chlorides | 5.0 | — | 200 or less |
| Iron (Fe) | 0.1 | 0.3~0.5 | 0.3 〃 |
| Total Solid | 143.0 | 500~1,000 | 500 〃 |
| Silica ($SiO_2$) | 23.0 | — | — |
| $R_2O_3$ ($A\ell_2O_3$ & $Fe_2O_3$) | 4.0 | — | — |
| Calcium (Ca) | 15.72 | 75~150 | 300 〃 |
| Aluminum ($A\ell$) | 1.94 | — | — |
| Magnesium (Mg) | 31.01 | 50~100 | 300 〃 |
| Sulfate ($SO_2$) | 4.94 | 200~300 | — |
| Fluorine (F) | — | 1.5 or less | 0.8 or less |
| Copper (Cu) | — | 1.0~1.2 | 1.0 〃 |
| Arsenic (As) | — | — | 0.05 〃 |
| Hardness ($CaCO_3$) | 62.0 | — | — |
| | | (Class AA) | — |
| | | drinking water standards in the Philippines | |

Accordingly, it will be necessary to induce in advance many or large power consuming industries at the Mindanao Grid. When power requirements are considered on the basis of the integrated steel mill, the scale of back-up power will vary greatly depending on the scale of the first phase of production and the pace of expansion of the steel mill.

Another problem involves power charges. At the present moment, 2.7 centavos is charged per KWH for power generated by Agus No.6 and served by the Mindanao Grid. The rate is very low compared with the rate charged in Luzon or by international standards. However, according to an informal estimate (Diagram 9) made by the National Power Corporation, the

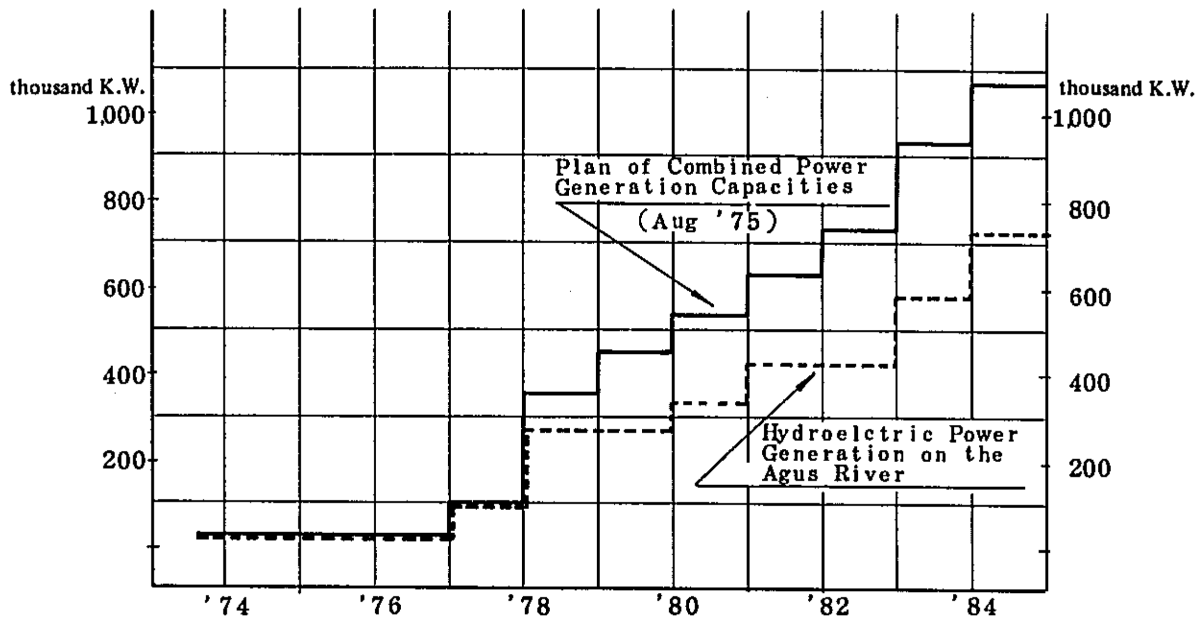
**Table 6 Outlook of MINDANAO Grid Power Supply Condition**

Aug, 1975

| Fiscal Year | Agus Hydro Power Stations | | Deasel Power Stations | |
|---|---|---|---|---|
| 1975 | Agus 6 (#1~#4) | 152 | | |
| '77 | Agus (#5) | 50 | | |
| '78 | Agus 2 (#1~#3) | 180 | | |
| 〃 | | | Deasel (#1~#4) | 64 |
| '79 | | | Deasel (PLPCO) | 62 |
| 〃 | | | Deasel (#5~#7) | 48 |
| '80 | Agus 7 (#1~2#) | 45 | | |
| 〃 | | | Deasel (#8~#9) | 32 |
| '81 | Agus 1 (#1~2#) | 100 | | |
| '82 | | | Thermal plant | 150 |
| '83 | Agus 3 (#1~#2) | 150 | | |
| '84 | Agus 5 | 150 | | |
| Total | | 827 thousandKW | | 356 thousandKW |

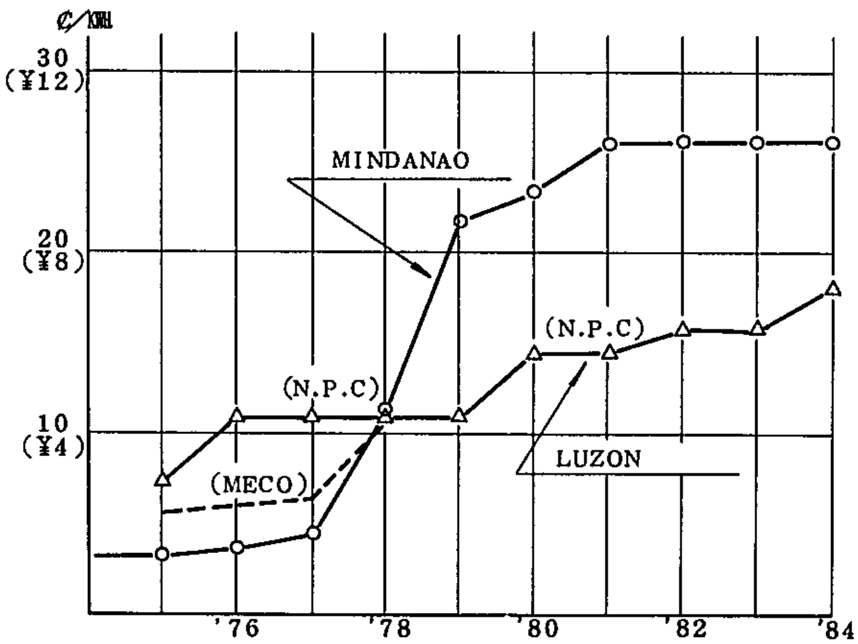
Source: National Power Corporation

Diagram 8  Trends in MINDANAO Grid Capacity




Source: National Power Corporation

Diagram 9  Estimated MINDANAO Power Charges




Assumption for estimated:

(1) Rate of price increase at 8%
(2) Interest rate at 8% level

Source:
National power Corporation

charges for power supplied by the Mindanao Grid will rise sharply in the future, accompanying the progress in electric power development, and may possibly outpace the charges in the Luzon area. It is desirable that the charges be kept as low as possible to induce power consuming industries into the area and hold the cost of the integrated steel mill operation at a low level. Should the estimate by the National Power Corporation be indicative of a future trend, a decision from the policy standpoint will be necessary in setting power charges.

Therefore, it should be kept in mind that the selection of the scale of the integrated steel mill and type of production facilities will greatly affect the generating capacity expected of the Mindanao Grid and charges.

Attention is also called to the fact that the Mindanao integrated steel mill has a geographical disadvantage in that it is away from the Luzon Grid with its large power generating capacity. Measures will have to be taken to deal with this situation.

4) Also requiring priority consideration are the creation of new towns to support industrial activities in the complex centering on the steel mill and the consolidation of communication networks, including telecommunications and air traffic, to encourage exchange of people and information with Manila and other urban communities.

There are, as noted above, some investment projects which call for implementation either simultaneously with or prior to construction of the integrated steel mill, although these may not be included in the account or funding for the construction of the steel mill.

This means, however, that in studying the scale of financing needed for the proposed integrated steel mill, financing for the indirect infrastructure, not to mention in-plant and direct infrastructure, must be considered in parallel.

### 3-4 Supporting Industries

1) Among the main industries which support the steel industry are those with metal forging and casting technology, fabricating and machinery processing technology, electric technology, ceramic technology, civil engineering and construction technology. The manufacture and repaire industries of tractors, automobiles, electric machinery, industrial machinery, ships, cans and containers, producers of fire bricks, construction industry, etc. presently in operation in the Philippines, should constitute the steel-related supporting industries.

The distribution of the main factories of these industries in the Philippines is given in Diagram 10. The majority of these are located in Luzon and especially in Greater Manila.

The Fact Finding Team visited steel consuming establishments in the Manila area, such as automobile assembly lines and steel structures processing units. Impressions of these visits can be summarized as follows:

These seems to be little reliance on other businesses with specialized skills i.e. subcontractors, with the result that the industrial network, meaning a relation of mutual dependence among businesses as well as among factories originating with industrial specialization, has yet to be fully organized. However, individual factories have fairly high potential with regard to machinery processing and sheet metal processing technologies.

2) The extent of direct linkage between the steel industry and other industries in the Philippines will be examined as follows from the point of view of procuring supplies and spare parts and of carrying out repairs.

a) Procurement of major domestic and overseas supplies is given in Table 7. It will be noted that consumables requirements is in a little way met by domestic products, the single exception being rolls. Lubricants are 100 per cent supplied by domestic producers.

**Diagram 10 Distribution of Major Industrial Installations (Materials prepared by BOI)**

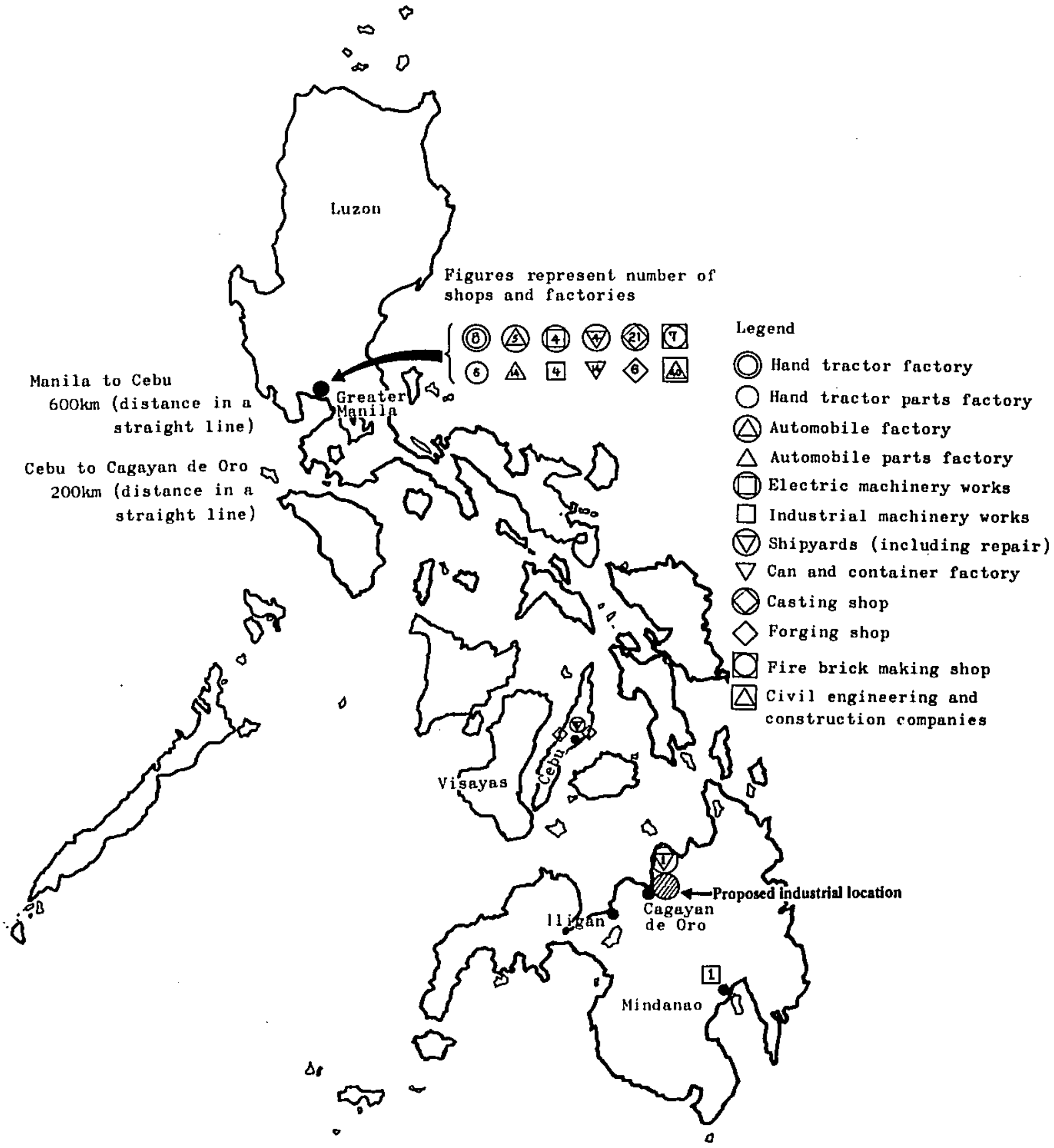


Table 7 Procurement of consumables by Philippine steel corporations

| Corporations / Consumables | NSC | | | ELISCON | | |
|---|---|---|---|---|---|---|
| | Domestic | Imports | Imported from | Domestic | Imports | Imported from |
| | % | % | | % | % | |
| 1. Roll | 0 | 100 | Japan, India | 0 | 100 | Japan |
| 2. Ingot Case | 30 | 70 | Japan, Taiwan | — | — | |
| 3. Electrode | 33 | 67 | Japan | — | — | |
| 4. Fire Brick | | | | | | |
| Ordinary | 65 | 35 | Taiwan | — | — | |
| Special | 62 | 38 | Taiwan | — | — | |
| 5. Lubricant | 100 | 0 | | 100 | 0 | |

Source: Materials supplied by NSC and ELISCON

b) As for spare parts, mass-produced parts, such as bearings, hydraulic instruments, electric machinery parts, electronics parts, etc., and parts for large machinery and heavy electric machinery are mostly supplied from overseas sources, with the result that the inventory level is high, in many cases amounting to over 6 months' supply.

c) Repairs of equipment and facilities and manufacture of parts for small machinery are done by in-plant shops and by own personnel assigned to the job. Dependence on outside sources is small. In the case of electric arc furnace steel makers in Japan, 30 to 40 per cent of machinery processing for repairs is done by in-plant machine tools, the rest being taken care of by outside specialist agents.

Beside repairs to machinery facilities the steel industry also requires repairs to buildings and other structures. In the case of the Philippines, individual enterprises have on their payrolls a considerable number of personnel for these assignments.

The situation with regard to dependence on outside establishments differs somewhat between the Manila area where industries are developed to a certain extent and Mindanao where supporting allied industries are almost absent. In the case of the latter, for example, repairs are mostly done by in-plant shops and by own personnel, while, in the case of the former, special work, such as repairs of boilers, piping and painting, is done by outside agents.

In general repair work requires much manpower though the kind of work and work load are by no means even. Besides, as will be discussed later, repair work in the case of an integrated steel mill is far greater than in the case of an electric arc furnace steel mill. Accordingly, it would be a heavy economic burden if repair work facilities and personnel were to be provided entirely by the steel mill itself, since there is too much variety in terms of individual work to be done and also because of slack and busy times. Even if the section in charge of repairs was to be established as a separate entity, it could hardly be an establishment independent of the steel mill so long as it fails to do business with other enterprises and other industries. If such a situation arises, the economic effect in terms of cost would be no different if the section remained part of the steel mill.

It is important to realize that generally speaking, a steel mill to be established in a region and at a time when industries are not fully developed is destined to face economic dis-advanctages.

Even when near self-sufficiency is provided as regards repair works at the start of operation, these will impose a heavy burden on the management of the mill. Thus, strenuous efforts are imperative to eliminate such economic disadvantages.

In this situation, a negative measure would be to rely on subsidies from the government to alleviate cost burdens, while a positive measure would be to promote the machinery industry on a national scale and to induce a number of machinery industries into the region, thereby assuring enough work for the repair section of the integrated steel mill and stimulating the development of specialized businesses equipped with specific technological capabilities.

Beside repair work, the overall operation of as integrated steel mill also requires, as will be referred to in Chapter 4 which deals with the operational characteristics of an integrated steel mill, many machinery and electrical engineers and specialities of high ability, not to mention metallurgical engineers and specialists. Therefore, efforts to promote and induce the machinery industry are also expected to be highly effective though indirectly, in bringing up and in securing people with such specialities.

Incidentally, steel mills with a long history in Japan started their operation with large scale machinery repair shops in their internal structure. In the case of some of these steel mills, the machinery repair section developed and later became a semi-independent entity specializing in the manufacture and marketing of machinery and machinery parts.

3) In studying the Mindanao integrated steel mill project, it is important to give due

consideration to promoting the ferro-alloy industry, which is expected to supply products at a fairly low cost by international standards, and to the growth of the fire brick industry which has already attained a certain level of development.

It is also important to try to achieve demestic production or to upgrade doemstic production of other items, such as rolls, ingot cases, allpurpose machinery, electric machinery parts, special fire bricks, etc., in order to compete with imported products.

Further, it is important to see that the inter-dependence being nurtured in the Greater Manila area between the steel industry and other industries, including the machinery industry, will also be realized in Mindanao.

### 3-5 Manpower

1) On visits to factories such as steel mills and steel using industries in the Philippines, the Fact Finding Team was impressed by the diligence of the workers and by the disciplined way these establishments were operated.

Statistically, however, unemployment remains high, and the Philippine government has been making great efforts to create jobs and improve the labor situation in the country.

2) The operation of a steel mill requires a number of engineers with higher education and well trained technical staff. As institutions of education and training which are an important base for developing such people, there exist in the Philippines vocational schools, polytechnic schools, colleges and universities, and, as institutions of vocational training, MIRDC (Metal Industry Research and Development Center), National Manpower and Youth Council and special training centers.

3) At present, college and university graduates with a science and engineering background number 12,000 to 13,000 a year, of which science majors count 7,000 to 8,000 and engineering majors 5,000. For engineers with higher education the demand and supply situa-

tion is somewhat eased, depending on the fields of specialization. However, the situation continues to be very tight for engineers who majored in metallurgy, mining and electronics. The shortage of specialists, people with specialized skills, is said to be much more accute.

To solve the problem, studies are being made, including the improvement of the educational system. For example, studies are being made on the creation of 4-year polytechnic institutes which will serve as institutions for high school graduates for specialist and practical technical education and training. Plans are to establish 3 such institutes within several years, allocating one to Mindanao. The institute scheduled in Mindanao is expected to cover specialized subjects, such as metallurgy, which are directly linked to the construction and operation of a large industrial complex.

4) Engineers with higher education and skilled workers will be indispensable for the stable operation of the proposed integrated steel mill. These people are also needed to strengthen the industrial foundation of the Philippines, which will in turn though indirectly, be an important factor in improving the competitiveness of the integrated steel mill.

The Fact Finding Team was pleased to find that measures to intensify the education and training of technical personnel is being seriously considered in this way.

It goes without saying that discretion should be exercised so that employment of technicians and skilled workers by the integrated steel mill will not affect the demand and supply of manpower for existing and new industrial establishments in the Philippines.

## IV General observations on the operation of an integrated steel mill

Observations will be made in this Chapter on general characteristics inherent in the operation of a blast furnace and of an integrated steel mill, in the hope that these will help understand the comments presented in the preceding chapter and the recommendations in the coming chapter.

### 4-1 Operational Characteristics of a Blast Furnace

4—1—1 Data concerning the operation of a blsat furncae

Examples of blast furnace operations in Japan will be given below.

1) Long term trends in blast furnace operation

Diagram 11 shows trends in the rate of operation of each of the 6 major blast furnaces in Japan (actual volume of pig iron produced by each blast furnace vis-a-vis its claimed capacity).

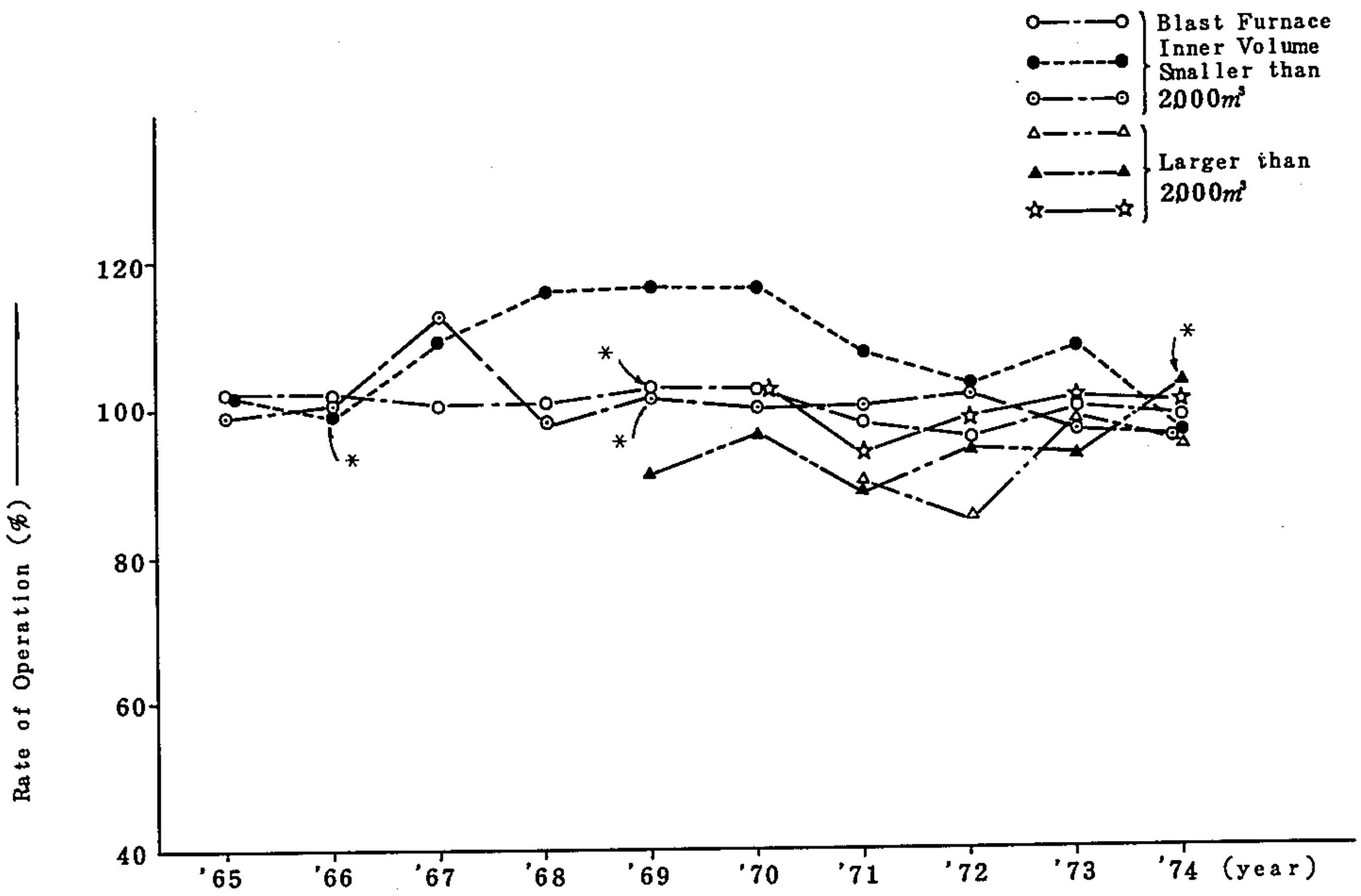
Evidently, the rate of operation of each blast furnace varies only 10 to 15 per cent and it is fair to say that operation has been relatively stabilized.

The years marked with an asterisk indicate that the blast furnace in question discontinued operation for several months for re-lining. However, in calculating the operation rate, capacity equivalent to the days of non-operation were subtracted so that the rate did not appear to drop sharply.

2) Short term trends in blast furnace operation

Diagram 12 shows trends in the rate of operation of the 6 blast furnaces in a 12-month period when the demand of steel was more than the supply, that is to say, when each blast furnace intended to operate in full capacity.

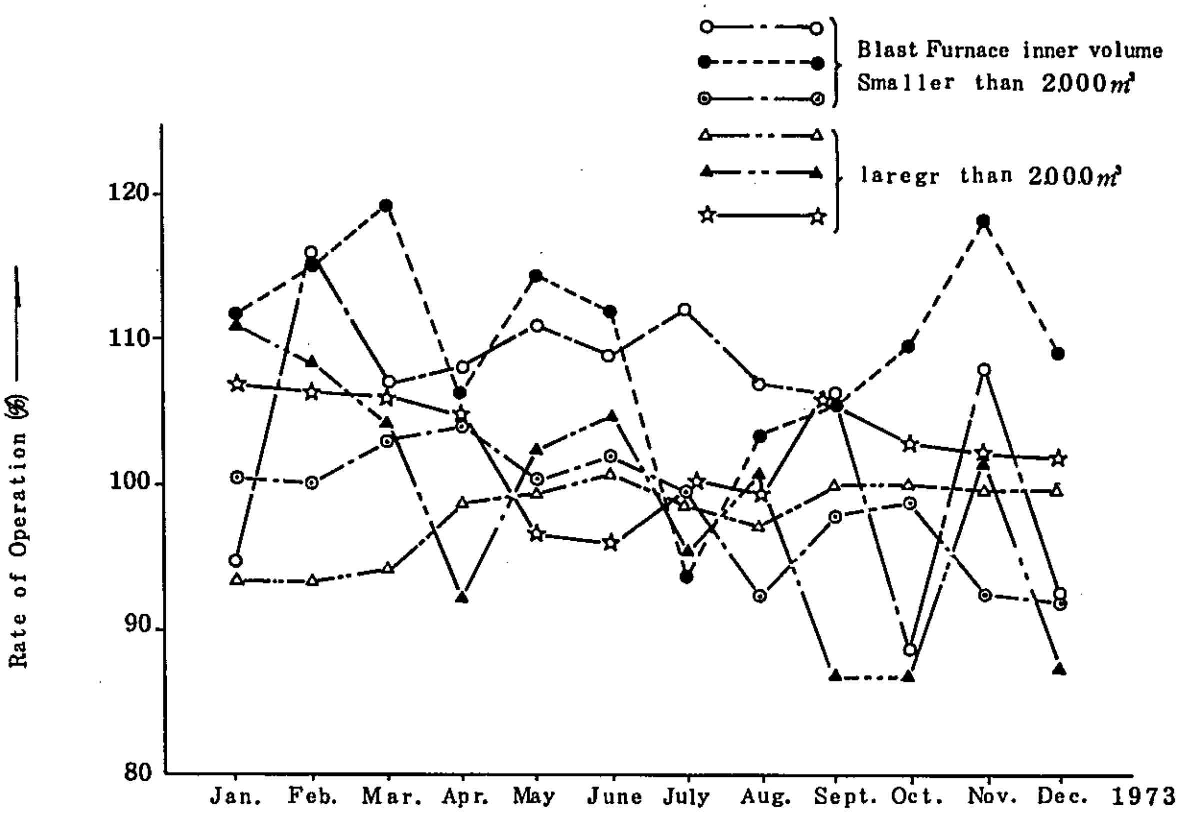
Diagram 11 Long Term Trends in blast Furnace Operation (Example in Japan)




Note: Asterisks indicates blast furnace relining.

Source: MITI

**Diagram 12  Short-term Trends in Blast Furnace Operation (Example in Japan)**




Source: MITI

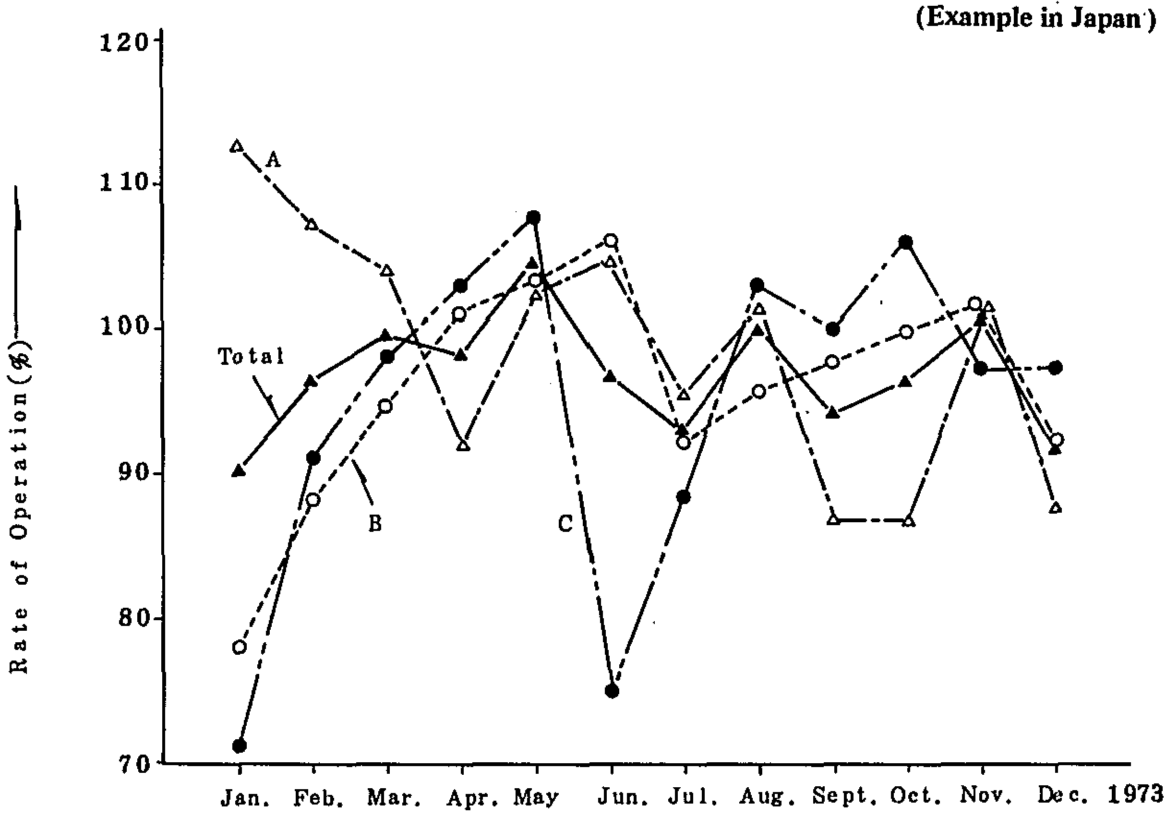
As is noted, only a few of the blast furnaces enjoyed stable operation, i.e. with small fluctuations. In the case of the others, such fluctuations ranged as much as 20 to 25 per cent of the rated capacity. Such large fluctuations are due mainly to operational troubles of the blast furnaces. Behind the stabilized operation over a long period as can be noted in Diagram 11, there are precautions against troubles and accurate judgment and proper measures when troubles occur.

3) Short term trends in the rate of blast furnace operation at a single steel mill

Diagram 13 plots trends in the operational rate at a single steel mill during the same period as the preceding diagram for the 6 blast furnaces.

The diagram shows that the overall rate of operation fluctuated only about 10 to 15 per cent, while the operational rate of individual blast furnaces moved wildly. It can be added that this suggests that an integrated steel mill with only one blast furnace will be risky in terms of both management and technology and that it should be considered transistional.

**Diagram 13 Total and Individual Blast Furnace Operation of an Integrated Steel Mill (Example in Japan)**




Source: MITI

4–1–2 Characteristics of a blast furnace

An integrated steel mill is distinguished from an electric furnace steel mill in having a blast furnace. Below are the operational characteristics of a blast furnace.

1) 3-phase reaction

The inside of a blast furnace is cylindrical, extremely simple structure. The pyrometallurgical reaction that takes place in the blast furnace is complicated with 3-phase reaction between solid (iron ore and coking coal), liquid (molten and semi-molten metal) and gas (blast furnace gas and air). In particular, 3-phase reaction which requires a high temperature of more than 1,600 degrees Centigrade is peculiar to the blast furnace. To maintain efficient reactions calls for great care in quality control of raw materials to be charged, specifically with respect to components, tenacity, granular size, etc. To assure this, the selection of raw materials at the purchasing stage is extremely important. As for iron ore, for example, a high Fe content is not necessarily an absolute requirement. The control of the quantity and percentage of substances such as $SiO_2$, $Al_2O_3$, CaO, generally taken as impurities, constitutes an important factor for smooth progress in reactions in the blast furnace.

Since coking coal varies in quality and nature from one mine to another, much more so than iron ore, it is estremely important to see that supply sources are diverse and that coal thus obtained is mixed at a percentage to assure the desired coking tenacity.

2) Continuous operation

The operation of a blast furnace requires continuous blowing in of hot air, charging of raw materials and flowing out of molten pig iron. In so doing, progress in pyrometallurgical reactions is maintained.

In the case of electric furnace steel making, it is possible to stop operation should a shortage of steel scrap occur, without causing any physical damage to the furnace. In the case of a blast furnace, however, once operation comes to a halt, for whatever reason, be it trouble in the equipment or facilities, or a failure in the supply of raw materials, reactions in the blast furnace will be disturbed, leading to a sharp drop in output. At the very worst, the temperature of the blast furnace will go down making it impossible to resume operation; thus, huge economic loss will be incurred.

Such being the case, once the operation of a blast furnace is started, it must continue day and night until the life of the furnace (usually 5 to 7 years) expires. Also, it is important that efforts be made to do so.

It is said to be extremely difficult to change the level of production by more than 10 per cent, without encountering problems in the reactions in the furnace.

3) Frequent troubles

It is difficult to define the kinds of troubles accompanying the operation of a blast furnace, because, if defined extensively, almost all the blast furnaces currently in operation would have to be called out of order. That is to say, no matter how much experience has been gained in the operation of a blast furnace, it does not serve to terminate turbulent reactions.

Misjudgement and wrong measures for irregular reactions will result in a sharp decrease in output. A blast furnace in trouble is just like a sick man. It takes time to convalesce, and low, uneconomical operation is unavoidable in the meantime. Depending on the case, the blast furnace may end up without demonstrating the normal production capacity expected of it. Chances of trouble increase as the blast furnace becomes larger.

4) Importance of experience for operation

There is a small window, less than 10 m/m in diameter, close to the tuyere at the bottom of the blast furnace, through which it is possible to see the flame inside the furnace. Needless to say, colored glasses are worn for this. However, no one sees the other parts of the interior of the blast furnace while in operation. Even if reactions were disturbed, resulting in a drop in pig iron outflow or in increased coke consumption, it would be impossible to halt operation and institute a remedial procedure.

The state of accumulation of charged materials or the progress in reaction inside the furnace is no more than a guess. This is why rich experience is indispensable in the operation of a blast furnace and, conversely, no experience, no matter how rich it is, is enough to assure stability of the furnace conditions.

5) Repair of a blast furnace

It the operation of a blast furnace is interrupted, it becomes impossible to resume operation if the inside cools off. In such a case the blast furnace will have to be destroyed and replaced by a new one. The period required for repairs (re-lining) is 3 to 4 months even when preparation for the work, such as orders for fire bricks and othe materials as well as the allocation of repair men and related workers, is made several years ahead.

6) Multiple blast furnace system

An integrated steel mill is usually designed to have more than 2 blast furnaces and is constructed that way. The installation of multiple blast furnaces makes it possible to minimize management risks accompanying sharp fluctuations in the volume of output, compared with the installation of a single large blast furnace. It also gives room for new experiments in terms of both technology and operation.

In short, a blast furnace can be compared to a hungry giant who is very sensitive to taste but who has a very weak stomach.

## 4-2 Operational Characteristics of an Integrated Steel Mill

4—2—1 Manpower requirements for the operation of an integrated steel mill

It would be useful to study an integrated steel mill from the angles of production activities, organization and manpower requirements.

The organization of a steel mill is generally divided into groups, as shown below, according to the requirements of the work, except for the functions attached to the head office.

G–1 General administration: general affairs, personnel, labor (including management of systems)

G–2 Production and business management: production plans, production pace adjustment, transport, purchases, contract management

G–3 Production: pig iron making, steel making, rolling, technology(including claim analysis, testing, analysis, etc.)

G–4 Equipment and facilities: maintenace and repair of machinery,thermal energy management, civil engineering and construction management, power management.

What would be the personnel requirements for each of these groups? The case of the proposed integrated steel mill in Mindanao was estimated after an example of a Japanese steel mill of comparable size, as given in Table 8.

Table 8 Manpower Structure at an Integrated Steel Mill in Japan

| | 2 Million Metric Tons | | | 4 Million Metric Tons | | |
|---|---|---|---|---|---|---|
| | Total | Staff | Line | Total | Staff | Line |
| G — 1 | 260 | 260 | 0 | 360 | 360 | 0 |
| G — 2 | 1,190 | 80 | 1,110 | 1,810 | 140 | 1,670 |
| G — 3 | 1,820 | 125 | 1,695 | 4,030 | 230 | 3,800 |
| G — 4 | 1,250 | 105 | 1,145 | 1,800 | 180 | 1,620 |
| Total | 4,520 | 570 | 3,950 | 8,000 | 910 | 7,090 |

Notes: (1) Head office sections not included
(2) Product mix, flow chart made by Philippine government data.
(3) Coke shop, chemical shop included; casting shop, power shop not included
(4) Scale of Maintenance shop after common case in Japan
(5) Subcontracted employees working at mill included.

As is shown, the share of manpower at an integrated steel mill is significantly high in the management (G–2) and the equipment and facilities groups, while G–3, namely, the group directly engaged in production activities, accounts for 50 per cent or less.

It is to be borne in mind that the manpower requirement estimates implicitly presuppose that various industries around the steel mill are developed and that many of the special work needed temporarily or the fabrication and repair of machinery parts can be taken care of by outside establishments.

4–2–2 Characteristics of an integrated steel mill

Operational characteristics of an integrated steel mill will be treated below, in comparison with those of an electric furnace steel mill.

1) Unification of operation

a) Materials flow

Looking at coordination between steel making and the preceding processes, in an electric furnace steel mill, the electric furnace shop will deal only with the scrap purchasing department, whereas, in the case of an integrated steel mill, the converter shop at least requires coordination with the blast furnace shop, meaning that it requires, though indirectly, coordination with the sintering shop, coke oven shop and raw materials (iron ore and coking coal) purchasing sections.

The greater complexity of the production processes at an integrated steel mill, compared with those of an electric furnace steel mill, is characteristic of the former which is destined to start with more crude raw materials. Therefore, management of materials flow to attain the desired production goal is essentially different from the case of an electric furnace steel mill. That is to say, not only production management or control within a single shop but also process management or control among many shops will assume great importance.

Process control or management is one of the important functions performed by the management group (G–2).

b) Energy flow

An integrated steel mill produces as by-products, quality inflammable gases, such as BFG, COG and LDG, in the upstream sections (pig iron making and steel making sections). A part of the gases is consumed within the upstream sections, such as in the hot stoves and coke ovens. It is also led by large pipes to rolling shops and in-plant power stations for use in the heating furnaces and power generating boilers. (Diagram 14)

This means that stable operation of the upstream sections, such as stabilized generation, recovery and supply of these gases, is indispensable for the stable operation of the whole mill.

c) Molten metal

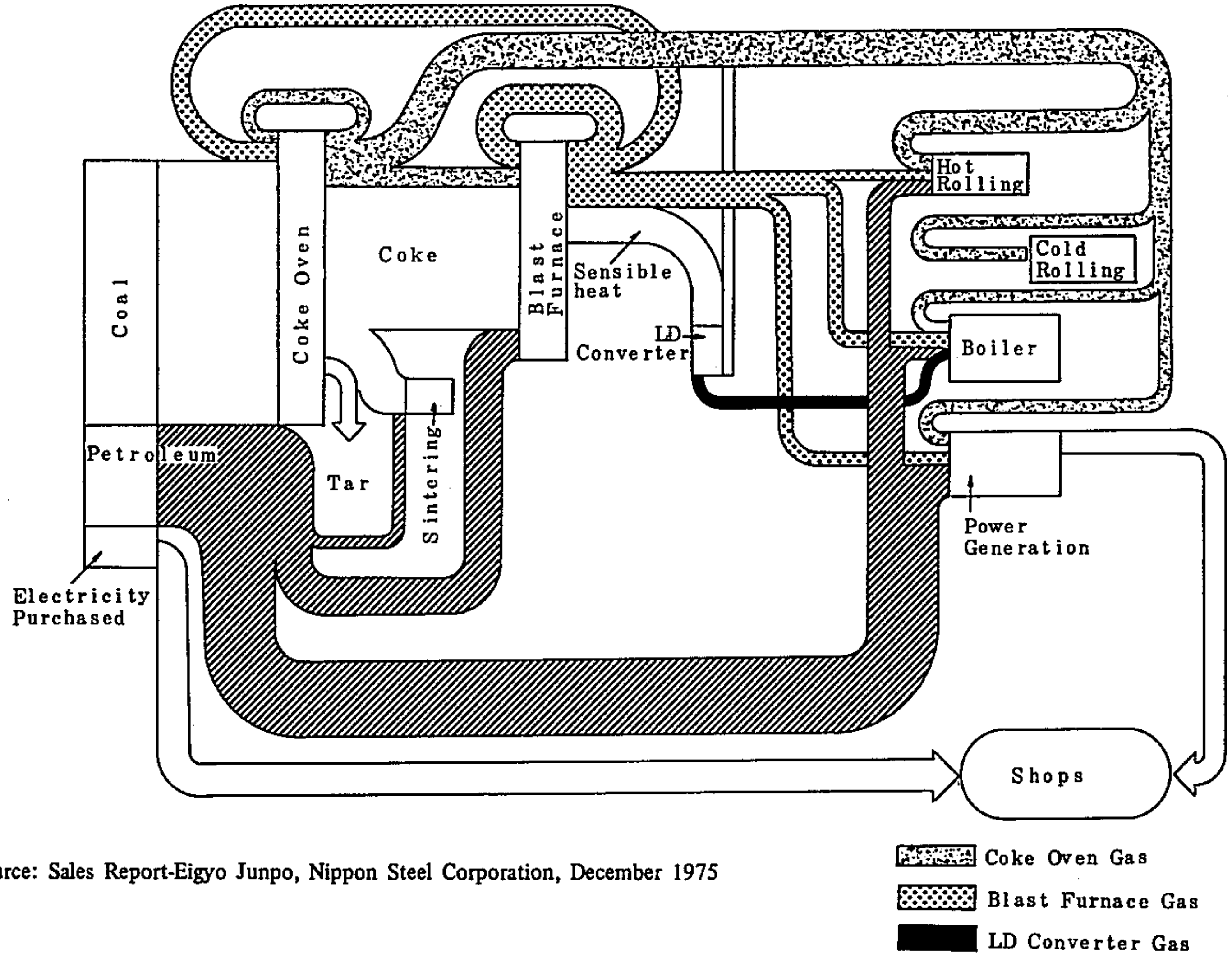
It is impossible to keep molten pig iron in its molten metal form for many hours. If cooled below a certain temperature, oxygen steel making becomes impossible.

Accordingly, no delay in any process which would cause a sharp drop in the temperature of molten pig iron is permissible in the flow of molten pig iron from the blast furnace through the converter into which oxygen is blown for steel making. The degree of progress in the steel making process is regulated, in terms of time, by the degree of progress in the preceding process, and reversely, affects the preceding process. This is a phenomenon unknown to electric furnace steel making in which there is no charging of molten metal.

2) Maintenance and repair of equipment and instruments

The operation of a steel mill is accompanied by high temperatures and high heat, and by treatment of quantities of heavy matter, with the result that the machinery and electric equipment are understandably subjected to troubles originating in heat, weight, pressure, dust, etc.

Diagram 14 Energy Flow at an Integrated Steel Mill




Source: Sales Report-Eigyo Junpo, Nippon Steel Corporation, December 1975

As mentioned earlier, however, trouble or malfunction of a part of equipment in an integrated steel mill will generate a chain of adverse effects not only on the process in question but on other processes as well, leading to a decline in the level of production of the whole mill or to a cost increment.

It is indispensable to carry out daily checkups and maintenance of all equipment and facilities in the mill so as to leave no room for trouble and malfunction, an important precaution against possible adverse consequences. Also, it is important to provide a setup capable of pinpointing the cause or causes of trouble or malfunction, should such an event arise, and of assuring quick repairs.

The maintenance and repair of such equipment and apparatus are extremely important functions of the equipment and facilities section (G—4). That is why much manpower is essential in this category.

3) Combined technology

An integrated steel mill is made up of a group of shops of a different nature. It usually has a metallurgical shop and a metal processing shop. In addition to these, there is a chemical shop, specializing in coking, chemical and synthetic products, and a large power generating plant to serve the mill. The nature of the mill being such, the speciality of engineers educted and trained at institutions of higher learning is not necessarily confined to metallurgy.

The requirement for engineers with higher education at the proposed Mindanao integrated steel mill, taken from a comparable example in Japan, would be shown table 9:

As the table shows, even when the capacity is 2 million tons and when the capacity of rolling mills is small, the requirement for machinery engineers and electric engineers will be just as great or larger than that for metallurgical engineers. When capacity grows to 4 million tons and rolling mills expand, the requirement for the former categories will be far larger than that for the latter, mainly due to the need to take charge of the equipment and facilities sec-

Table 9. Distribution of Engineers Required for Operation of an Integrated Steel Mill

| | 2 million metric tons | | | | | 4 million metric tons | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Metallurgy | machinery | electric | others | total | Metallurgy | machinery | electric | others | total |
| G − 1 | − | 1 | 16 | 5 | 22 | − | 1 | 23 | 6 | 30 |
| G − 2 | 2 | 3 | 1 | 2 | 8 | 5 | 6 | 1 | 3 | 15 |
| G − 3 | 52 | 27 | 7 | 17 | 103 | 82 | 69 | 14 | 24 | 189 |
| G − 4 | 1 | 45 | 31 | 14 | 91 | 2 | 77 | 54 | 25 | 158 |
| total | 55 | 76 | 55 | 38 | 224 | 89 | 153 | 92 | 58 | 392 |

Electric : heavy and light (electronics, measurement, computers)

Others : engineers with higher education, specializing in chemical engineering, civil engineering, construction, managerial engineering, chemistry, physics, etc.

tion (G–4).

In addition, a fairly large number of engineers with chemical engineering, civil engineering and construction and managerial engineering backgrounds will be required.

### 4-3 Some Observations on Scale

An integrated steel mill is cited as an example of a plant which enjoys economy of scale, as is the case with a petrochemical plant. Thus, the decision on scale or size certainly constitutes an important task in the formulation of an integrated steel mill project. Above all, discretion will have to be exercised in selecting the scale at the initial stage, which is very decisive, as well as at the final stage especially when an integrated steel mill will be constructed for the first time in a country.

In view of the foregoing, an analysis of data concerning the size of blast furnaces and of an integrated steel mill is attempted together with some observations as follows:

1) Steel industry and industrialization

Diagram 15 plots trends in the share of the manufacturing industry in each country from 1960 through 1970, and at the same time shows characteristic features of the steel industry in that country. By share is meant the percentage of the value of output by the manufacturing industry in the gross domestic product and is represented simply by figures. However, it can also indicate to a certain extent in a broader sense, the degree of development of infrastructure of the country in question, namely, the national social and industrial foundation which will affect in no small measure the degree of industrial development.

The steel industry is generally recognized to be the base of industrialization and the diagram may point to this fact. However, on the other hand, it suggests the importance of the existence and/or development of direct or indirect supporting industries as a condition for the construction of a large integrated steel mill, which is sometimes more important for the stabilized operation of an integrated steel mill than to have superiority of equipment, facilities and engineers at such an integrated steel mill itself.

Needless to say, it must be borne in mind that this kind of macroanalysis is unavoidably dependent on the shares of agriculture, mining and tertiary industries in the individual countries and that statistical accuracy is not necessarily uniform.

2) Steel industry and machinery industry

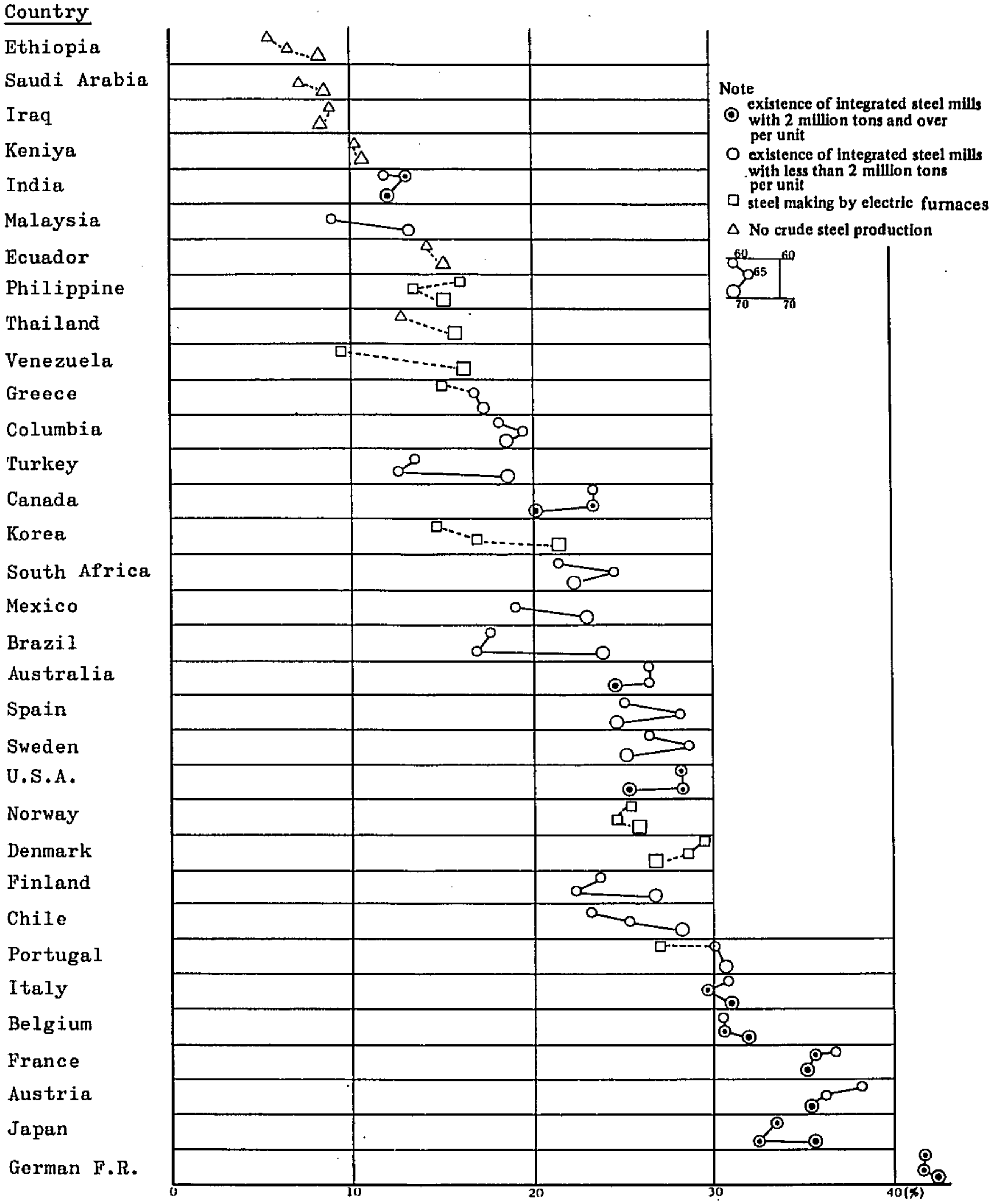
An indicator of the degree of progress in industrialization is the share of the manufacturing industry as mentioned above. Another indicator, used to check the substance of that industry in more concrete terms, is the ratio of machinery exports, which reveals the extent of machinery industry development in terms of the ratio of machinery exports to the total value of exports. Diagram 16 shows relations between the ratio of machinery exports and per capita steel production.

It is impossible to formulate by such an analysis a law commonly applicable to all countries, regardless of differences in economic development of these nations.

The diagram indicates, however, that the development of the steel industry will stimulate machinery exports, and that the expansion of machinery exports, i.e. the development of the machinery industry, will serve either directly or indirectly to strengthen the basis on which the steel industry is founded.

In short, the efficient operation of an integrated steel mill is extremely difficult, and the smooth management of the steel mill presupposes a social and industrial foundation represented by the development of the manufacturing industry such as the machinery industry. In studying plans to build an integrated steel mill, more attention should be paid to the demonstration of full capacity of equipment and facilities, rather than to the capacity scale of the steel mill's equipment and facilities. There have been a number of cases in the past in which the economy of scale expected at the planning stage was overshadowed in actual opera-

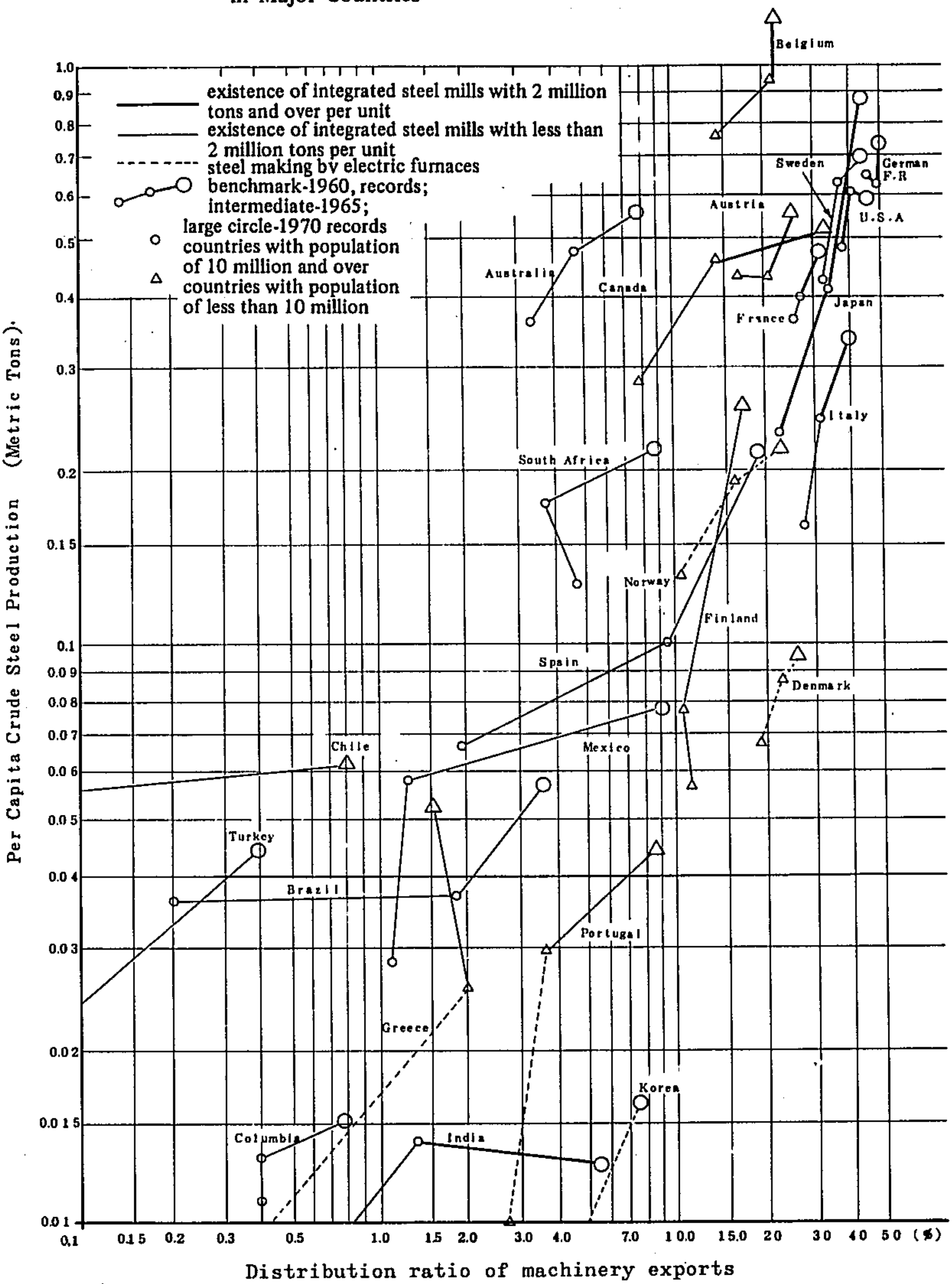
## Diagram 15 Trends in Shares of Manufacturing Industry in Major Countries




Share of Manufacturing Industry (%): Output of Manufacturing Industry/GDP

Source: (1) Share of Manufacturing Industry (Yearbook of National Accounts Statistics, UN)
(2) Scale of Production (JISF, Estimate)

**Diagram 16 Machinery Exports Ratios and per Capita Crude Steel Production in Major Countries**



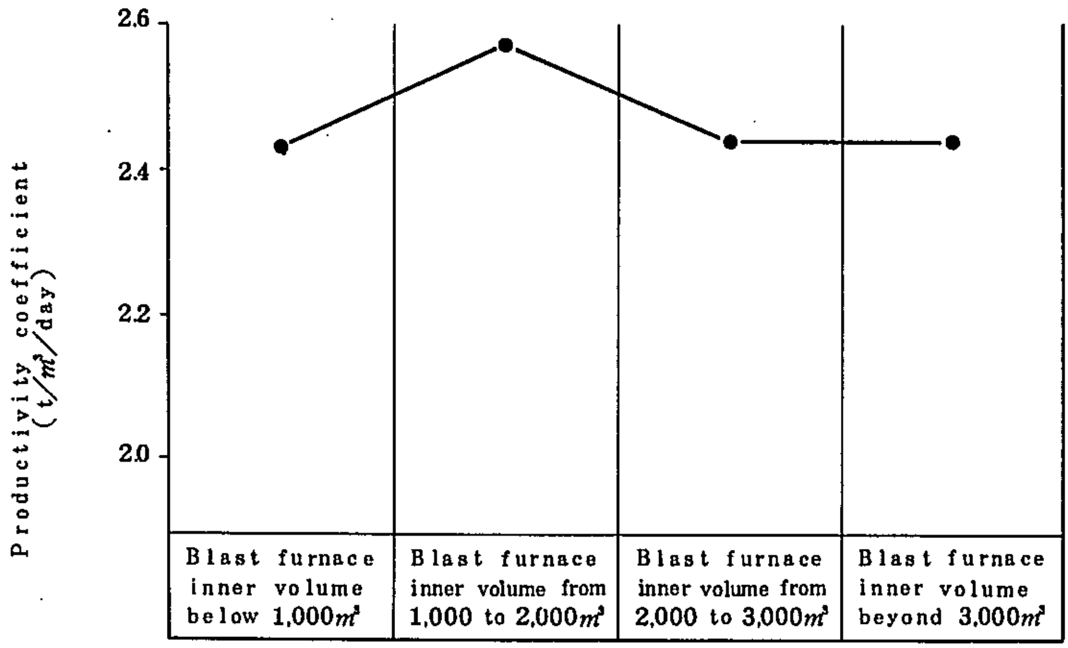

Source: (1) Distribution ratio of machinery exports, population (Statistical Year Book, UN)
(2) Scale of Production (JISF, Estimate)

tion by a negative factor, namely, poor rate of operation.

3) Blast furnace productivity

Diagram 17 plots, on the basis of the latest data available in Japan, the highest average annual production efficiency (the ratio of pig iron production) attained in each of the 4 blast furnaces groups by cubic capacity. As an index to compare production efficiency of a blast furnace, the ratio of pig iron production (average output of pig iron per day (t)/cubic capacity ($m^3$)) is generally employed. This means that the higher the ratio of pig iron output, the better the production efficiency of the blast furnace.

Diagram 17 Productivity Coefficient by Blast Furnace Capacity (Example in Japan)



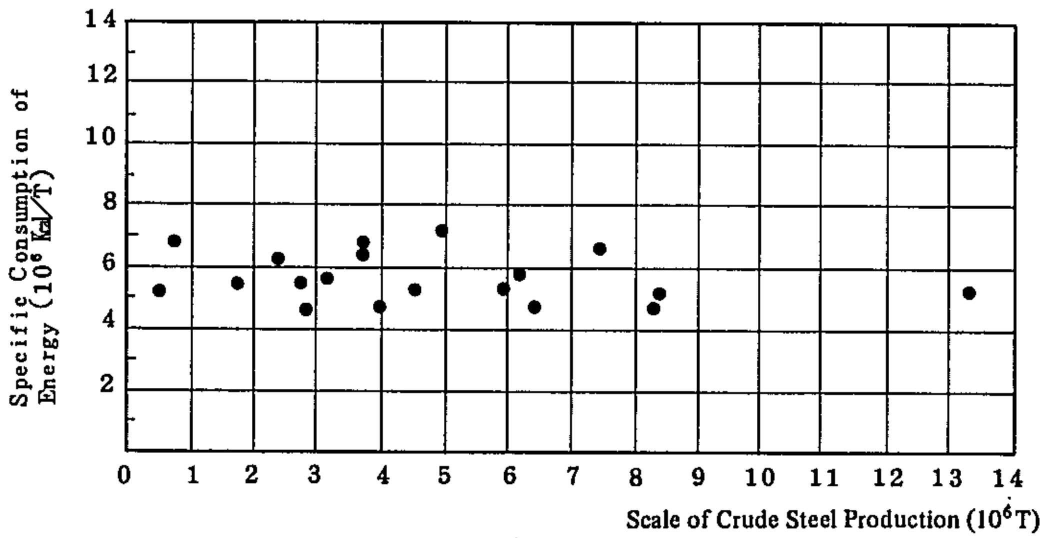

Source: MITI

As is clear from the diagram, there is enough room for a small blast furnace to attain a pig iron output ratio equivalent to that of a larger blast furnce.

4) Scale of an integrated steel mill and thermal efficiency

By comparing the ratio of thermal energy consumption with that of crude steel production, the basic unit of thermal energy consumption per ton of crude steel of a given integrated steel mill can be obtained. Examples in Japan are given in Diagram 18. This shows

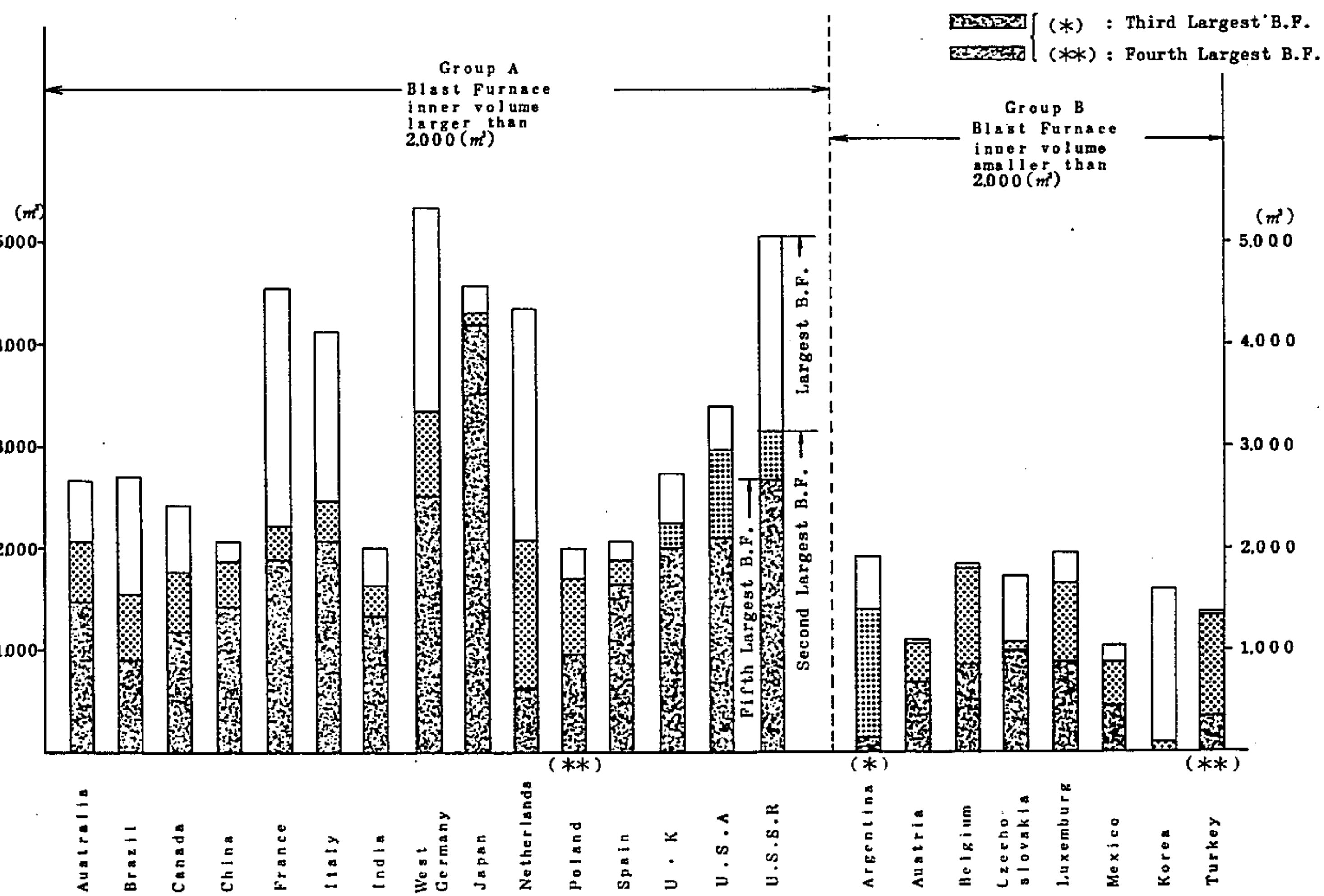
Diagram 18 Relations between Crude Steel Production and Specific Consumption of Net Energy (Example in Japan)




Source: ISIJ

generally that the higher the basic unit, the lower the thermal efficiency. On the other hand, when products shipped from an integrated steel mill are semi-finished, the value of the unit falls, while, if they are cold rolled products or surface treated products, it rises. As such, the unit is subjected to the method of product mix, with the result that it does not necessarily indicate the quality of thermal efficiency. Other factors that affect the level of thermal ef-

## Diagram 19 Scale of Blast Furnaces in Major Steel Producing Countries




(Note) (1) Capacity is given in total volume

(2) Group A: All countries haveing B.F.s of more than 2,000 $m^3$
Group B: Few examples of countries haveing B.F.s of less than 2,000 $m^3$

(3) As of end of 1974

(Source) JISF (Estimated)

ficiency are the design of equipment and facilities of the said steel mill and the technological standards of thermal energy management in daily operation. Accordingly, each plotting shows a slight difference due possibly to differences in the product mix, equipment designs and thermal energy management technologies. Nevertheless, it is impossible to observe in the diagram the general trend that the larger the integrated steel mill in size, the better thermal energy efficiency will be.

5) International distribution of blast furnaces by scale

Diagram 19 gives the cubic capacities of the largest, second and fifth largest blast furnaces in operation in these countries at present. For some of the blast furnaces, the cubic capacities were estimated. Also, only a few examples are given for furnaces with a capacity of smaller than 2,000 $m^3$, due to restrictions in availability of data. As can be seen from the diagram, each country started with smaller blast furnaces and moved on to the construction and operation of larger blast furnaces after gaining experience with the former.

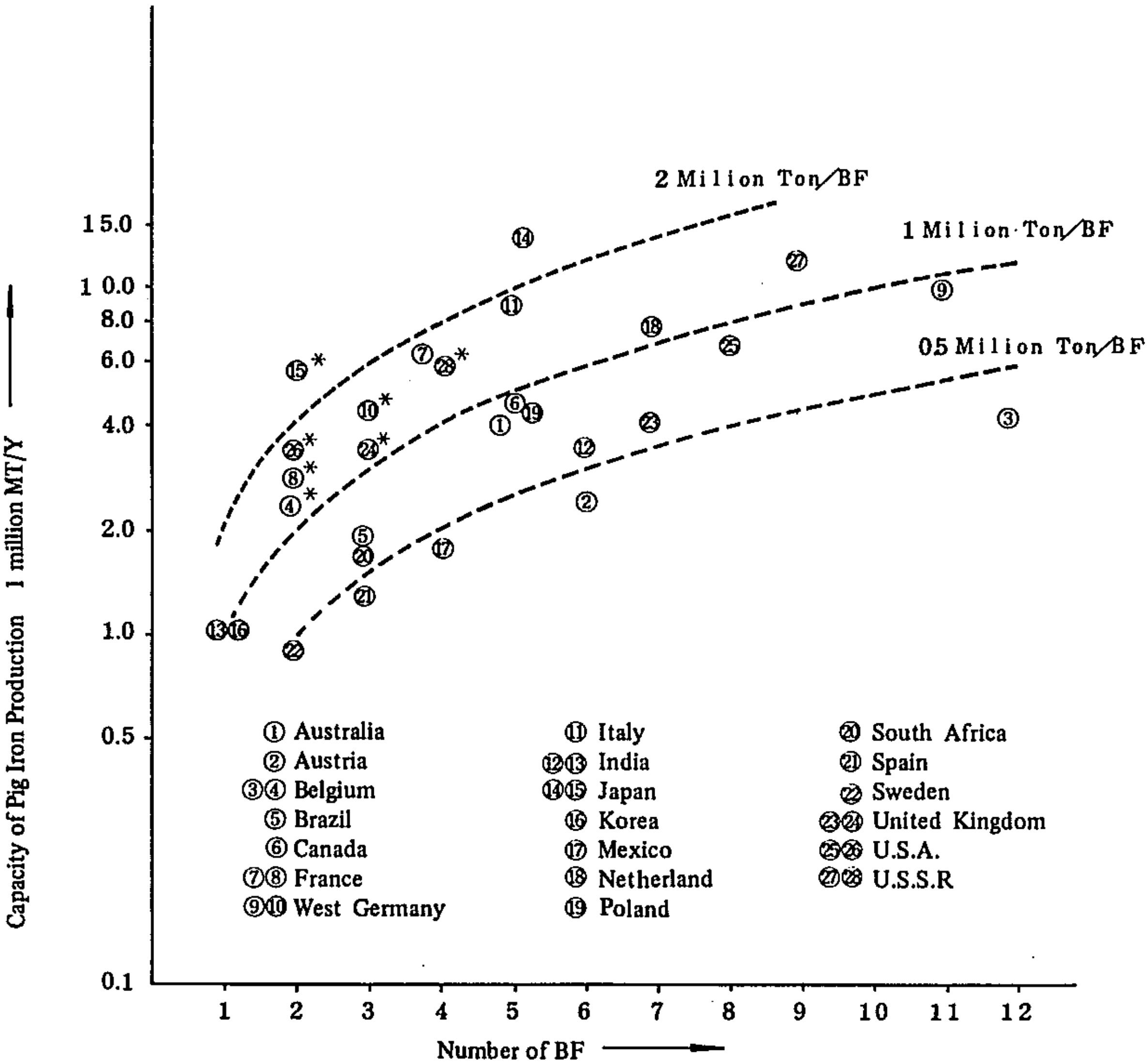
6) Scale of an integrated steel mill

Diagram 20 shows the sizes of leading steel mills (largest and newest) and the number of blast furnaces at these plants in major steel producing countries in the world.

Steel mills with an annual pig iron production capacity of 2 million tons and over are in operation, to the best of the knowledge of the Fact Finding Team, in only 15 countries at present. The majority of these steel mills are made up of a number of small or medium scale blast furnaces.

This phenomena may reflect historical considerations behind these steel mills and the philosophy of the steel industrialists in these countries. The table was included in this report with the hope that it may serve as a reference to studies or surveys by the Philippine government.

Diagram 20 Scale of Leading Steel Mills in Major Steel Producing Countries




Note: * The newest steel mill (as of end of 1974)
Source: JISF (Estimated data)

## V Recommendations and conclusion

Reviewing the ways and means of advancing the Mindanao integrated steel mill project, in the days ahead the Team wishes to summarize its views as follows.

The first point concerns production scale in the first phase of the integrated steel mill project for better planning. The second refers to a rough time schedule for the period prior to the commencement of construction and operation, which was drawn up on the basis of developments to date of studies by the Philippine side. The third is related to tasks to be carried out by the Philippine side for the time being in promoting studies along the line of the schedule.

### 5-1 Selection of Production Scale in Planning

1) The Mindanao integrated steel mill project is recognized as the central to the promotion of industrialization, since the construction and operation of the steel mill is expected to generate a number of economic spin-offs.

On the other hand, it must be recalled, as stated earlier, that industrialization of the country is an important prerequisite to smooth construction and operation of an integrated steel mill.

Further, the presence of a single blast furnace in the development stage of an integrated steel mill must be considered an irregular or transitional stage as stability in blast furnace operation will be hard to assure. Thus, the shorter the period of single blast furnace operation, or the sooner the period of double blast furnace operation comes (in 2 to 3 years), the better.

Therefore, it is important to keep in mind that multiple blast furnace operation can supply steel demand better than that of a few large blast furnaces. Preference for a small number of large blast furnaces should not be adhered to. Moreover, the construction of an integrated steel mill requires huge funds and any failure in attaining the expected level of operation will be a big drain to the national economy. When a country is going to establish an integrated steel mill for the first time, direction will have to be exercised in the selection of production scale in the first stage of the project. Such a cautious approach will assure smooth expansion of production in the period that follows.

2) Taking all these points into consideration, it is recommended that the proposed first stage of the project be divided into two parts, so as to make the Mindanao project more workable. That is to say, the scale of crude steel production in the first half of the first phase (single blast furnace: Stage I–A) should be set at under one million tons per annum, and the scale of annual crude steel output in the second half of the first phase (2 blast furnaces: Stage I–B) at double the volume of Stage I–A or more. The scale and timing of Stage I–B production should be finalized taking into account the experience of construction and operation and the demand trends in the steel consuming sectors. In order to shift from Stage I–A, and irregular and risky stage with single blast furnace operation, to Stage I–B, a more stable and double blast furnace stage, at an early date, concrete studies should be undertaken from now on both for Stage I–A and Stage I–B.

3) Even though production of an integrated steel mill may be considered rather small at the initial stage of operation, operation is difficult from a quality standpoint compared with an electric furnace steel mill of a similar size. However small, an integrated steel mill has all the characteristics of the blast furnace and the integrated steel mill referred to in Chapter 4.

## 5-2 Time Schedule for Period Prior to Construction and Operation

1) Presented here is a time schedule for the preparatory stage of construction and operation of the Mindanao integrated steel mill. The preparatory stage can be divided into 4 pre-stages, as given below.

Pre-Stage A

i) Establishment of a special commission

ii) Appointment of people in charge of fields of study

iii) Study on construction plans

iv) Undertaking and evaluation of pre-feasibility studies

Pre-Stage B

i) Enactment of a law to assist the development of the steel industry or the integrated steel mill

ii) Establishment of an integrated steel mill corporation

iii) Decision on the skeleton of business plans and construction plans, including work following the results and recommendations of the pre-feasibility studies.

iv) Conducting and evaluation of feasibility studies

Pre-Stage C

i) Decision on business plans and construction plans, including work following the results and recommendations of the feasibility studies

ii) Decision on implementation of these plans

Pre-Stage D

i) Commencement of contract negotiations and placing of orders for equipment and instruments

ii) Commencement of construction work

iii) recruitment and training of workers

### 5-3 Tasks Ahead

1) Pre-Stage A will constitute the initial stage of the Mindanao integrated steel mill construction project. The process from Pre-Stage A through Pre-Stage D will by no means be easy. Even when the pre-feasibility studies or feasibility studies are entrusted to outside institutions, the Philippine government authorities or the integrated steel mill corporation must not be concerned with the evaluation of the results of these studies alone. Studies are prone to assumptions and hypotheses. In reaching a final decision, assumptions and hypotheses should be minimized as far as possible. If any exist, their materialization or realization must prove to be highly probable. In other words, the more assumptions these are the lesser the material will be available for decision-making on the possibility of moving to the next stage.

2) An important task in Pre-Stage A will be the consolidation of the social and industrial foundation. This includes promotion of electric power development, inducement of power consuming industries, replenishment of industrial technology education, promotion of the machinery industry, and consolidation of existing steel mills. These will constitute important elements to support, directly or indirectly, the economic operation of the integrated steel mill in the years ahead. Also, the consolidation of the social and industrial foundation will diminish the possibility of assumptions and hypotheses in pre-feasibility studies.

3) Another important task in Pre-Stage A will naturally be the study on the Mindanao integrated steel mill project. In the hope that these will prove useful to the Philippine government, the Team wishes to make suggestions concerning the setup and the matters to be considered in studying the Mindanao integrated steel mill project in the days ahead.

i) Organization for study

a) It is suggested that under the ISA organization, a Special Commission on Mindanao Integrated Steel Mill Project be created charged with the task of making reports, based on its expertise, on matters concerning the Mindanao integrated steel mill construction project, whenever sought for by the ISA.

b) The Commission is authorized to create subcommittees, if necessary, for detailed studies on matters in the fields concerned.

ii) Composition of the Commission

The Commission as well as its subcommittees will be composed of administrators and researchers of the government agencies concerned, and, if necessary, of scholars and experts from the private sector.

iii) Matters for study

Important matters for study will center for example on the following 4 points. For details of each of these, the Appendix can be referred to.

a) Outlines of the Mindanao integrated steel mill project (production scale, etc.)

b) Types and sizes of infrastructure to be consolidated

c) Measures for assuring raw materials requirements

d) Funding requirements, direct and indirect, prior to operation

In studying these matters, it is important to assure full studies, from a policy standpoint, on the extent to develop the scale of the existing electric furnace steel mills and the rolling mills. Also, it is desirable, whenever necessary, to send survey teams abroad and to invite experts from abroad. Exchanges of views, made possible by these opportunities, are expected to assist in in-depth studies of the matters in question.

iv) Points requiring the attention of the Philippine government

The direction of studies and the extent of these studies in Pre-Stage A will determine progress in consolidating the social and industrial foundation, as well as the facility and difficulty of the shift to Pre-Stage B.

a) Accordingly it is important to allocate enough time and manpower to Pre-

Stage A, since this stage will serve as a period for the training of personnel in charge of the integrated steel mill corporation. These are the people who will be responsible for achieving the project assignments in their respective special fields in Pre-Stage B.

b) It is also important to begin making preparations, at a proper time in Pre-Stage A, to enact a law designed to favor the development of the steel industry or the integrated steel mill. The objectives of the law will be to clarify the details and the extent of the measures taken by the Philippine government to assist the construction and operation of the integrated steel mill.

Appendix:

Matters for study

1. Study on the outlines of the Mindanao integrated steel mill project
   - a) Consolidation of various domestic statistics
   - b) Refinement of demand estimates by steel products
   - d) Scale of crude steel production and product mix at the single blast furnace stage and the double blast furnace stage
   - d) Estimation of utilities requirements
   - e) Estimation of transport requirements for raw materials and steel products
2. Type, size and means of consolidating infrastructure
   - a) Electric power (volume of power generation, transmission lines, policy on power charges)
   - b) Means of raw materials transportation (domestic and international)
   - c) Means of products transportation
   - d) Ports and harbors
   - e) Communications facilities

f) Water

g) Housing

3. Assurance of raw materials requirements

   a) Surveys on domestic and overseas raw materials

   b) Clarification of policy concerning domestic production and imports of iron ore, coking coal, limestone, ferroalloy, fluorite, etc.

   c) Measures to assure raw materials requirements

4. Study on funding requirements for the construction of the integrated steel mill

   a) Study on the extent of envestment projects (public and private investments) required directly and indirectly for the construction and operation of the integrated steel mill

   b) Compiling of a time schedule for the above investment projects

   c) Study on indentification of investors in the above projects (with special reference to the types of investment projects possibly taken care of by the integrated steel mill corporation, liability methods and liability share)

**5-4 Conclusion**

1) It is a tendency in deciding the scale of the first step of an integrated steel mill project that priority consideration be given to national prestige rather than to experience in mill management and operation and the economic, social and industrial foundation on which to build the steel mill. However, the situation is different in the Philippines. The Team was impressed to note that the Philippine Government is determined to promote the project in a very realistic manner, immune from such preoccupations.

2) Steel demand and industrial development in the Philippines have probably now reached the stage when it is imperative to draw up an integrated steel mill project and work

toward its implementation.

3) A number of countries have built modern integrated steel mills during the past quarter century which have been the first of their kind in those countries. However, only a few of them have successfully produced the economic effect expected of them, while the others have, on the contrary, become a heavy burden to the national economies.

4) It is earnestly hoped that the first step taken by the Philippines in an integrated steel mill project will lead to further expansion and development in the future, not sharing the fate of these other countries, and it is also hoped, therefore that further efforts will be directed to promoting and expanding all industries, including the existing steel and machinery industries, along with studies on the proposed integrated steel mill project itself.

## REFERENCE MATERIALS–(A) AND (B)

(A) DEMAND FORECAST

(B) TRANSPORTATION OF PRODUCTS

## CONTENTS

REFERENCE MATERIALS – (A)

## Demand Forecast

### I Introduction

1) Demand forecast is intended to predict future trends in demand. A desirable method to be employed for the purpose will be the one which will help grasp possible future fluctuations in demand accompanying the mode of economic management. That is to say, since steel demand is closely associated with economic trends, the desirable method of forecast will have to be so designed as to assure changes in estimated values of steel demand linked with changed in the prospects of gross national product or major components of GNP.

2) With this in mind, the Team started, in carrying out the task of making demand estimates, with an analysis of past steel demand in the Philippines, and tried, by so doing, to grasp certain trends and correlations which would be useful in forecasting.

The next step was to estimate steel demand on the assumption of several cases of future economic conditions, so as to show how the trends or the correlations thus found could be utilized in forecasts. That is to say, this was intended to show possible changes in the quantity of steel demand and the variety of steel products, accompanying differences in future economic prospects.

3) Mention must be made here that the Team, in undertaking the analyses of which the approaches and findings will be discussed in the following, owed immeasurably to the assistance and cooperation of the Philippine side which supplied the former with statistical data and other essential materials. The analyses would not have been possible without them. The Team, wishes to compliment the Philippine side on the efficient work they have been do-

ing over years on the collection and analysis of data and materials of vital importance for such understanding.

## II Steel demand analysis

The methods employed for the analysis of steel demand are generally divided into 2 kinds, namely, macro-approach and micro-approach. The Team has attempted an analysis, on the basis of statistical information, of the Philippine economy and the data on steel consumption supplied by the Philippine side, so as to study the extent to which these 2 forecasting methods could be adopted.

The analysis of steel demand requiring compilation and analysis of data on past steel consumption, the Team has analysed and estimated domestic consumption mainly on the basis of the NSC and MIRDC data.

The figures may be slightly different from those prepared so far by the Philippine side. However, they are essentially not much different from those of the NSC data.

The findings will be summarized in Table ①. (Also, Tables ② to ⑤). The NSC estimates have been heavily relied in working out consumption patterns, the substance of consumption by sectors and by products.

### 2–1 Macro-appraoch analysis

A correlation analysis was made of GNP vs. domestic demand for crude steel, obtained by the above mentioned procedures, and of GDCF vs. the latter. (Diagrams ① and ②).

It was confirmed that, likewise the results of similar works undertaken already by the Philippine side, the inter dependence among the variables was slight and that this does not qualify as a basic forecasting formula. The reasons behind the poor interdependence would be as follows:

# Table(1) Trends in Apparent Domestic Demand by products (Summary)

Unit : 1,000 Metric tons

| | Galvanized Sheets | Tin Plates | Cold Rolled Sheets | Plates | Hot Rolled Sheets | Pipes & Tubes | Bars | Wires Rods | Sections | Finished Steel Total | Crude Steel Equivalent | (Reference) Apparent Crude Steel Consumption NSC Data |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1962 | 82.6 | 47.0 | ⊖ 2.3 | 23.0 | 4.6 | 19.7 | 110.8 | 38.8 | 25.9 | 349.9 | 445.5 | 488 |
| 63 | 94.7 | 68.7 | 12.5 | 27.8 | 16.8 | 26.2 | 135.0 | 56.7 | 39.5 | 477.9 | 609.2 | 578 |
| 64 | 110.5 | 71.9 | 17.5 | 36.2 | 10.7 | 30.5 | 163.4 | 52.6 | 38.0 | 531.3 | 676.0 | 713 |
| 65 | 126.4 | 85.0 | ⊖ 1.2 | 42.1 | 1.1 | 40.1 | 167.8 | 62.2 | 42.4 | 565.9 | 722.4 | 769 |
| 66 | 120.2 | 88.2 | 4.8 | 39.7 | 11.1 | 38.5 | 203.8 | 65.5 | 47.2 | 619.0 | 791.0 | 826 |
| 67 | 136.2 | 92.3 | 40.9 | 76.6 | 19.8 | 56.4 | 220.6 | 97.2 | 55.5 | 795.5 | 840.0 | 968 |
| 68 | 145.2 | 98.5 | 59.6 | 84.0 | 31.1 | 66.6 | 212.3 | 86.2 | 56.5 | 840.0 | 1,062.0 | 1,057 |
| 69 | 169.5 | 91.4 | 158.3 | 83.2 | ⊖ 9.7 | 55.9 | 221.4 | 105.0 | 39.6 | 914.6 | 1,149.6 | 1,023 |
| 70 | 143.2 | 107.2 | 161.8 | 66.2 | 73.6 | 59.1 | 228.1 | 84.2 | 24.2 | 947.6 | 1,189.1 | 990 |
| 71 | 122.3 | 85.4 | 101.8 | 54.2 | 79.9 | 57.5 | 248.6 | 101.7 | 26.5 | 877.9 | 1,105.0 | 1,057 |
| 72 | 136.6 | 112.2 | ⊖ 73.8 | 72.6 | 51.9 | 50.4 | 260.8 | 95.5 | 18.3 | 724.6 | 930.2 | 1,028 |
| 73 | 135.8 | 113.0 | 109.0 | 70.0 | 53.9 | 74.1 | 275.6 | 112.4 | 21.1 | 964.9 | 1,219.3 | 1,113 |
| 74 | 87.3 | 124.8 | 64.4 | 71.8 | 78.0 | 50.6 | 280.6 | 79.1 | 40.1 | 876.7 | 1,118.6 | 1,177 |
| 75 | | | | | | | | | | | | 1,377 |
| 77 | 198.9 | 147.9 | 175.5 | 110.7 | 88.2 | 104.0 | 430.9 | 161.9 | 32.6 | 1,450.6 | 1,828.8 | |
| 88 (Case A) | 270.0 | 184.9 | 241.9 | 151.4 | 124.4 | 136.3 | 615.1 | 215.9 | 44.1 | 1,984.0 | 2,498.6 | |
| (Case B) | 252.5 | 176.8 | 218.3 | 136.3 | 111.4 | 128.5 | 568.9 | 201.4 | 40.0 | 1,834.1 | 2,311.3 | |
| (Case C) | 243.4 | 189.6 | 229.0 | 144.1 | 115.0 | 127.2 | 527.7 | 199.8 | 42.0 | 1,818.2 | 2,291.8 | |
| (Case D) | 208.2 | 198.5 | 214.4 | 135.1 | 104.1 | 113.0 | 425.7 | 177.8 | 38.8 | 1,615.5 | 2,041.5 | |
| Growth Rate (%) '73/'62 | 4.6 | 8.3 | — | 10.6 | 25.1 | 12.8 | 8.6 | 10.2 | △ 1.8 | 9.7 | 9.6 | 7.8 |
| '77/'73 | 10.0 | 7.0 | 12.6 | 12.1 | 13.1 | 8.8 | 11.8 | 9.6 | 11.5 | 10.7 | 10.7 | |
| '80(A)/'73 | 10.3 | 7.3 | 12.1 | 11.7 | 12.7 | 9.1 | 12.2 | 9.8 | 11.1 | 10.8 | 10.8 | |
| '80(B)/'73 | 9.3 | 6.6 | 10.4 | 10.0 | 10.9 | 8.2 | 10.9 | 8.7 | 9.6 | 9.6 | 9.6 | |
| '80(C)/'73 | 8.7 | 7.7 | 11.1 | 10.9 | 11.4 | 8.0 | 9.7 | 8.6 | 10.3 | 9.5 | 9.4 | |
| '80(D)/'73 | 6.3 | 8.4 | 10.1 | 9.8 | 9.9 | 6.2 | 6.4 | 6.8 | 9.1 | 7.6 | 7.6 | |
| Share (%) '62 | 23.6 | 13.4 | ⊖ 0.7 | 6.6 | 1.3 | 5.6 | 31.8 | 11.1 | 7.3 | 100 | | |
| '73 | 14.0 | 11.7 | 11.3 | 7.3 | 5.6 | 7.7 | 28.6 | 11.6 | 2.2 | 100 | | |
| '77 | 13.7 | 10.2 | 12.1 | 7.6 | 6.1 | 7.2 | 29.7 | 11.2 | 2.2 | 100 | | |
| '80(A) | 13.6 | 9.3 | 12.2 | 7.6 | 6.3 | 6.9 | 31.0 | 10.9 | 2.2 | 100 | | |
| '80(B) | 13.8 | 9.6 | 11.9 | 7.4 | 6.1 | 7.0 | 31.0 | 11.0 | 2.2 | 100 | | |
| '80(C) | 13.4 | 10.4 | 12.6 | 7.9 | 6.3 | 7.0 | 29.1 | 11.0 | 2.3 | 100 | | |
| '80(D) | 12.9 | 12.3 | 13.3 | 8.4 | 6.4 | 7.0 | 26.3 | 11.0 | 2.4 | 100 | | |
| Ratio of Crude Steel Conversion | 1.153 | 1.464 | 1.190 | 1.250 | 1.178 | 1.178 | 1.294 | 1.294 | 1.294 | | | |

## Table ②–(1) Trends in Demand and Supply of Steel in the Philippines

Unit : 1,000 Metric tons

| Year / Products | 1962 | | | | 1963 | | | | 1964 | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Output | Imports | Further Processing | Domestic Demand | Output | Imports | Further Processing | Domestic Demand | Output | Imports | Further Processing | Domestic Demand | |
| Cold Rolled | | | | | | | | | | | | | |
| Galvanized Sheets | 78.8 | 3.8 | — | 82.6 | 87.9 | 6.8 | — | 94.7 | 104.0 | 6.5 | — | 110.5 | |
| Tin Plates | 1.6 | 45.4 | — | 47.0 | 5.5 | 63.2 | — | 68.7 | 27.1 | 44.8 | — | 71.9 | |
| Cold Rolled Sheets | — | 79.3 | 81.6 | ⊖ 2.3 | 0.2 | 108.1 | 95.8 | 12.5 | 28.1 | 129.9 | 140.5 | 17.5 | |
| Hot Rolled | | | | | | | | | | | | | |
| Heavy & Medium Plats | — | 23.0 | — | 23.0 | — | 27.8 | — | 27.8 | — | 36.2 | — | 36.2 | |
| Sheets & Coils | — | 8.8 | 4.2 | 4.6 | — | 21.2 | 4.4 | 16.8 | — | 48.6 | 37.9 | 10.7 | |
| Pipes & Tubes | 4.0 | 15.7 | — | 19.7 | 4.0 | 22.2 | — | 26.2 | 8.7 | 21.8 | — | 30.5 | |
| Long Products | | | | | | | | | | | | | |
| Bars | 95.3 | 15.5 | — | 110.8 | 119.2 | 15.8 | — | 135.0 | 128.6 | 34.8 | — | 163.4 | |
| Wire Rods & Wire | 6.0 | 32.8 | — | 38.8 | 6.3 | 50.4 | — | 56.7 | 7.0 | 45.6 | — | 52.6 | |
| Sections | — | 25.7 | — | 25.7 | — | 39.5 | — | 39.5 | — | 38.0 | — | 38.0 | |
| Finished Products Total | 185.7 | 250.0 | 85.8 | 349.9 | 223.1 | 355.0 | 100.2 | 477.9 | 303.5 | 406.2 | 178.4 | 531.3 | |
| Steel Casting & Forging | | 0.3 | | | | 0.6 | | | | 1.1 | | | |
| Semis & Ingots | | 33.5 | | | | 31.7 | | | | 65.6 | | | |
| Crude Steel | | | | 445.5 | | | | 609.2 | | | | 676.0 | |
| U.N | | | | (390) | | | | (594) | | | | (684) | |

Note: 1 In the absence of available data on production of hot rolled sheets, coils and cold rolled sheets, at the Philippines, estimates were computed on basis of Philippine data on domestic demand and imports. Production of the items relied on Philippine data. (Table③) Production figures for 1973 and 1974 are as published by PISI.

2 PISI improt statistics adopted. For years no figures available, BCS and JISF statistics substituted. (Table④)

3 Taking into account yield as shown in Table⑤ estimated consumption in the further processing was calculated on basis of following formulas: a) Cold rolled sheets consumption in the further processing=galvanized sheet production x 1.01 + tin plate production x 1.282, and b) Hot rolled coil consumption in the further processing =cold rolled sheet production x 1.021 + pipe production x 1.053.

4 Domestic demand (on finished steel basis) = production + imports – further processing. However, inventory fluctuations not reflected on domestic demand.

## Table ② – (2) (continued)

Unit : 1,000 Metric tons

| Products \ Year | 1965 | | | | 1966 | | | | 1967 | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Output | Imports | Further Processing | Domestic Demand | Output | Imports | Further Processing | Domestic Demand | Output | Imports | Further Processing | Domestic Demand | |
| Cold Rolled | | | | | | | | | | | | | |
| Galvanized Sheets | 119.9 | 6.5 | — | 126.4 | 115.3 | 4.9 | — | 120.2 | 132.5 | 3.7 | — | 136.2 | |
| Tin Plates | 39.7 | 45.3 | — | 85.0 | 46.9 | 41.3 | — | 88.2 | 47.7 | 44.6 | — | 92.3 | |
| Cold Rolled Sheets | 9.1 | 161.7 | 172.0 | ⊖ 1.2 | 0.2 | 181.2 | 176.6 | 4.8 | 4.0 | 231.9 | 195.0 | 40.9 | |
| Hot Rolled | | | | | | | | | | | | | |
| Heavy & Medium Plates | — | 42.1 | — | 42.1 | — | 39.7 | — | 39.7 | — | 76.6 | — | 76.6 | |
| Sheets & Coils | — | 24.9 | 23.8 | 1.1 | — | 25.1 | 14.0 | 11.1 | — | 42.4 | 22.6 | 19.8 | |
| Pipes & Tubes | 11.6 | 28.5 | — | 40.1 | 13.1 | 25.4 | — | 38.5 | 17.6 | 38.8 | — | 56.4 | |
| Long Products | | | | | | | | | | | | | |
| Bars | 132.8 | 35.0 | — | 167.8 | 166.3 | 37.5 | — | 203.8 | 193.6 | 27.0 | — | 220.6 | |
| Wire Rods & Wire | 13.8 | 48.4 | — | 62.2 | 25.9 | 39.6 | — | 65.5 | 50.0 | 47.2 | — | 97.2 | |
| Sections | — | 42.4 | — | 42.4 | — | 47.2 | — | 47.2 | — | 55.5 | — | 55.5 | |
| Finished Products Total | 326.9 | 434.8 | 195.8 | 565.9 | 367.7 | 441.9 | 190.6 | 619.0 | 445.4 | 567.7 | 217.6 | 795.5 | |
| Steel Casting & Forging | | 3.8 | | | | 3.0 | | | | 5.2 | | | |
| Semis & Ingots | | 95.3 | | | | 160.6 | | | | 190.8 | | | |
| Crude Steel | | | | 734.1 | | | | 791.0 | | | | 1,009.4 | |
| U.N | | | | (777) | | | | (816) | | | | (1,084) | |

## Table ②– (3) (continued)

Unit : 1,000 Metric tons

| Products \ Year | 1968 | | | | 1969 | | | | 1970 | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Output | Imports | Further Processing | Domestic Demand | Output | Imports | Further Processing | Domestic Demand | Output | Imports | Further Processing | Domestic Demand | |
| Cold Rolled | | | | | | | | | | | | | |
| Galvanized Sheets | 136.9 | 8.3 | – | 145.2 | 151.6 | 17.9 | – | 169.5 | 137.6 | 5.6 | – | 143.2 | |
| Tin Plates | 50.0 | 48.5 | – | 98.5 | 43.5 | 47.9 | – | 91.4 | 67.4 | 39.8 | – | 107.2 | |
| Cold Rolled Sheets | – | 262.0 | 202.4 | 59.6 | 138.5 | 228.7 | 208.9 | 158.3 | 298.8 | 88.4 | 225.4 | 161.8 | |
| Hot Rolled | | | | | | | | | | | | | |
| Heavy & Medium Plates | – | 84.0 | – | 84.0 | 1.0 | 82.2 | – | 83.2 | – | 66.2 | – | 66.2 | |
| Sheets & Coils | – | 55.5 | 24.4 | 31.1 | – | 227.6 | 237.3 | ⊖ 9.7 | 163.0 | 234.7 | 324.1 | 73.6 | |
| Pipes & Tubes | 23.2 | 43.4 | – | 66.6 | 22.8 | 33.1 | – | 55.9 | 18.0 | 41.1 | – | 59.1 | |
| Long Products | | | | | | | | | | | | | |
| Bars | 184.0 | 28.3 | – | 212.3 | 196.5 | 24.9 | – | 221.4 | 201.6 | 26.5 | – | 228.1 | |
| Wire Rods & Wire | 67.4 | 18.8 | – | 86.2 | 82.1 | 22.9 | – | 105.0 | 62.9 | 21.3 | – | 84.2 | |
| Sections | – | 56.5 | – | 56.5 | – | 39.6 | – | 39.6 | – | 24.2 | – | 24.2 | |
| Finished Products Total | 461.5 | 605.3 | 226.8 | 840.0 | 636.0 | 724.8 | 446.2 | 914.6 | 949.3 | 547.8 | 549.5 | 947.6 | |
| Steel Casting & Forging | | 5.2 | | | | 5.2 | | | | 2.1 | | | |
| Semis & Ingots | | 190.8 | | | | 180.0 | | | | 279.3 | | | |
| Crude Steel | | | | 1,062.0 | | | | 1,149.6 | | | | 1,189.1 | |
| U.N | | | | (1,080) | | | | (1,306) | | | | (1,351) | |

## Table ②– (4) (continued)

Unit : 1,000 Metric tons

| Products \ Year | 1971 | | | | 1972 | | | | 1973 | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Output | Imports | Further Processing | Domestic Demand | Output | Imports | Further Processing | Domestic Demand | Output | Imports | Further Processing | Domestic Demand | |
| Cold Rolled | | | | | | | | | | | | | |
| Galvanized Sheets | 114.0 | 8.3 | – | 122.3 | 132.0 | 4.6 | – | 136.6 | 121.3 | 14.5 | – | 135.8 | |
| Tin Plates | 45.4 | 40.0 | – | 85.4 | 69.6 | 42.7 | – | 112.3 | 72.4 | 40.6 | – | 113.0 | |
| Cold Rolled Sheets | 204.5 | 70.6 | 173.3 | 101.8 | 94.5 | 54.2 | 222.5 | ⊖ 73.8 | 285.2 | 39.1 | 215.3 | 109.0 | |
| Hot Rolled | | | | | | | | | | | | | |
| Heavy & Medium Plates | – | 54.2 | – | 54.2 | – | 72.6 | – | 72.6 | – | 70.0 | – | 70.0 | |
| Sheets & Coils | 184.0 | 134.9 | 239.0 | 79.9 | 19.1 | 153.5 | 120.7 | 51.9 | – | 383.5 | 329.6 | 53.9 | |
| Pipes & Tubes | 28.7 | 28.8 | – | 57.5 | 23.0 | 27.4 | – | 50.4 | 36.5 | 37.6 | – | 74.1 | |
| Long Products | | | | | | | | | | | | | |
| Bars | 230.8 | 17.8 | – | 248.6 | 244.6 | 16.2 | – | 260.8 | 256.5 | 19.1 | – | 275.6 | |
| Wire Rods & Wire | 75.5 | 26.2 | – | 101.7 | 76.4 | 19.1 | – | 95.5 | 87.2 | 25.2 | – | 112.4 | |
| Sections | – | 26.5 | – | 26.5 | – | 18.3 | – | 18.3 | – | 21.1 | – | 21.1 | |
| Finished Products Total | 882.9 | 407.3 | 412.3 | 877.9 | 659.2 | 408.6 | 343.2 | 724.6 | 859.1 | 650.7 | 544.9 | 964.9 | |
| Steel Casting & Forging | | 10.7 | | | | 8.2 | | | | 6.2 | | | |
| Semis & Ingots | | (176.3) | | | | (154.7) | | | | (172.8) | | | |
| Crude Steel | | | | 1,105.0 | | | | 930.2 | | | | 1,219.3 | |
| U.N | | | | (814) | | | | (798) | | | | (1,206) | |

Table ②– (5) (continued)

Unit : 1,000 Metric tons

| Products \ Year | 1974 | | | |
|---|---|---|---|---|
| | Output | Imports | Further Processing | Domestic Demand |
| Cold Rolled | | | | |
| Galvanized Sheets | 81.6 | 5.7 | – | 87.3 |
| Tin Plates | 88.2 | 36.6 | – | 124.8 |
| Cold Rolled Sheets | 230.8 | 29.1 | 195.5 | 64.4 |
| Hot Rolled | | | | |
| Heavy & Medium Plates | – | 71.8 | – | 71.8 |
| Sheets & Coils | – | 346.9 | 268.9 | 78.0 |
| Pipes & Tubes | 31.6 | 19.0 | – | 50.6 |
| Long Products | | | | |
| Bars | 242.5 | 38.1 | – | 280.6 |
| Wire Rods & Wire | 35.2 | 43.9 | – | 79.1 |
| Sections | | 40.1 | – | 40.1 |
| Finished products Total | 709.9 | 631.2 | 464.4 | 876.7 |
| Steel Casting & Forging | | 9.8 | | |
| Semis & Ingots | | 188.6 | | |
| Crude Steel | 232.7 | | | 1,118.6 |
| U.N | | | | |

## Table ③ Demand and Supply by Products, Philippine Statistics

Unit : Metric Tons

| | Hot Rolld | | | Cold Rolled | | | Tin Plates | | | Galvanized Sheets | | | Pipes & Tubes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Output | Imports | Domestic Demand | Output | Imports | Domestic Demand | Output | Imports | Domestic Demand | Output | Imports | Domestic Demand | Output | Imports | Domestic Demand |
| 1962 | ▲ 142 | 90,930 | 90,788 | — | 76,474 | 76,474 | 1,580 | 32,898 | 34,478 | 78,783 | 13,155 | 91,938 | 4,000 | 10,119 | 14,119 |
| 1963 | ▲ 853 | 73,345 | 72,492 | 246 | 60,460 | 60,706 | 5,506 | 51,045 | 56,551 | 87,903 | 6,139 | 94,042 | 4,000 | 14,970 | 18,970 |
| 1964 | ▲ 444 | 159,553 | 159,109 | 28,148 | 112,183 | 140,331 | 27,122 | 50,321 | 77,443 | 104,000 | 6,265 | 110,265 | 8,664 | 16,860 | 25,524 |
| 1965 | ▲ 52 | 188,315 | 188,263 | 9,146 | 152,912 | 162,058 | 39,732 | 44,651 | 84,383 | 119,942 | 4,536 | 122,283 | 11,646 | 12,601 | 24,247 |
| 1966 | ▲28,252 | 177,577 | 149,325 | 161 | 122,513 | 122,674 | 46,872 | 40,213 | 87,085 | 115,298 | 6,985 | 121,995 | 13,144 | 8,218 | 21,362 |
| 1967 | ▲17,405 | 241,347 | 223,942 | 3,990 | 184,275 | 188,265 | 47,706 | 56,733 | 104,439 | 132,479 | 4,212 | 136,691 | 17,613 | 20,648 | 38,261 |
| 1968 | ▲37,183 | 320,101 | 282,918 | — | 233,861 | 233,861 | 49,953 | 40,588 | 90,541 | | 3,407 | 140,266 | 23,199 | 40,643 | 63,842 |
| 1969 | ▲41,940 | 439,386 | 397,446 | 138,481 | 227,306 | 365,787 | 43,460 | 27,994 | 71,454 | 151,594 | 2,384 | 153,972 | 22,757 | 24,860 | 47,617 |
| 1970 | 162,973 | 339,306 | 502,279 | 298,792 | 168,698 | 467,490 | 67,445 | 15,166 | 82,611 | 137,569 | 2,335 | 139,281 | 18,047 | 31,706 | 49,753 |
| 1971 | 183,962 | 135,609 | 319,571 | 204,513 | 90,643 | 295,156 | 45,358 | 32,341 | 77,699 | 114,000 | 2,464 | 110,601 | 28,656 | 16,395 | 45,051 |
| 1972 | 19,114 | 322,293 | 341,407 | 94,526 | 128,499 | 223,025 | 69,591 | 34,765 | 104,356 | 132,000 | 1,044 | 132,930 | 23,000 | 15,000 | 38,646 |
| Sources | ① Table 3.5 | | | ① Table 6.7 | | | ② EXB-3.1 | | | ① Table 12.1.3.14 | | | ② EXC-4.1 | | |

| | Bars | | | Wire Rods & Wires | | | Plates | | | Structual Shapes & Sections | | | Iron & steel Products | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Output | Imports | Domestic Demand | Output | Imports | Domestic Demand | Output | Imports | Domestic Demand | Output | Imports | Domestic Demand | Output | Imports ⊖Exports | Domestic Demand |
| 1962 | 95,347 | 20,976 | 118,323 | 6,000 | 43,465 | 49,465 | — | 29,300 | 29,300 | — | 20,927 | 20,927 | 104,213 | 296,110 | 400,323 |
| 1963 | 119,243 | 20,259 | 139,552 | 6,300 | 44,521 | 50,821 | — | 32,200 | 32,200 | — | 28,183 | 28,183 | 109,197 | 344,547 | 453,744 |
| 1964 | 128,565 | 40,815 | 169,380 | 6,963 | 55,435 | 62,398 | — | 35,500 | 35,500 | — | 36,615 | 36,615 | 92,490 | 515,854 | 608,344 |
| 1965 | 132,796 | 52,168 | 184,964 | 13,773 | 52,682 | 66,455 | — | 39,000 | 39,000 | — | 37,918 | 37,918 | 78,596 | 553,244 ⊖ 106 | 631,734 |
| 1966 | 166,294 | 51,393 | 217,687 | 25,877 | 44,069 | 69,946 | — | 42,900 | 42,900 | — | 39,267 | 39,267 | 75,405 | 662,779 ⊖ 2,164 | 736,020 |
| 1967 | 193,604 | 36,982 | 230,586 | 50,025 | 38,873 | 88,898 | — | 47,200 | 47,200 | — | 58,818 | 58,818 | 91,732 | 792,506 ⊖ 17 | 884,221 |
| 1968 | 183,999 | 31,037 | 215,036 | 67,418 | 48,994 | 116,412 | — | 56,359 | 56,359 | — | 93,421 | 93,421 | 88,146 | 839,291 ⊖ 626 | 926,811 |
| 1969 | 196,490 | 27,195 | 223,685 | 82,088 | 26,013 | 108,101 | 971 | 41,595 | 42,566 | — | 103,955 | 103,955 | 110,034 | 937,942 ⊖ 51,967 | 996,009 |
| 1970 | 201,579 | 32,437 | 234,016 | 62,887 | 25,104 | 87,991 | 7,297 | 40,060 | 47,357 | — | 36,167 | 36,167 | 106,938 | 940,961 ⊖ 82,448 | 965,451 |
| 1971 | 230,753 | 19,260 | 250,013 | 75,477 | 37,997 | 113,474 | 4,261 | 53,524 | 57,785 | — | 40,925 | 40,925 | 205,778 | 563,117 ⊖ 62,685 | 686,447 |
| 1972 | 244,551 | 12,100 | 256,651 | 76,386 | 50,214 | 126,600 | 178 | 51,377 | 51,555 | — | 28,586 | 28,586 | | | 990,926 |
| Sources | ② D-2.1 | | | ① Table 27 ② EXD-3.1 | | | ② EXC-1.1, 2.1 | | | ② D-4.1 | | | ③ Table 2.3.4. | | |

Sources: ① A Report on the Iron and Steel Industry of the Philippins (NEDA, Dr. ANTONIO V. ARIZABAL)
② Demand Study on Iron and Steel Products (NSC)
③ Primary Iron & Steel Industry of the Philippines (MIRDC)

Note: In the absence of Philippines data on hot rolled and cold rolled production, estimates were computed by a domestic demand – impotrs formula, for compilation in Table ②. Years with negative figures were rounded to zero when entered in Table ②.

## Table ④– (1) Comparison of Import Statistics (Flat products)

Unit: 1,000 Metric tons

| | Coils for Rerolling | | | (Hot) Sheet Strip | | | | Cold Sheets | | | Plates | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JISF | IISI | BCS | JISF | IISI | BCS | ECE | JISF | IISI | BCS | JISF | IISI | BCS | ECE |
| 1962 | | | | 8.8 | 1.7 | | | 79.3 | 86.4 | | 21.5 | 23.0 | | |
| 63 | | | | 21.2 | 6.6 | | | 102.4 | 122.7 | | 27.3 | 27.8 | | |
| 64 | | | | 48.6 | 9.2 | | | 129.2 | 169.3 | | 35.9 | 36.2 | | |
| 65 | — | | | 24.9 | | | | 161.7 | 161.7 | | 42.2 | 42.1 | | |
| 66 | — | | | 25.1 | 25.1 | | | 171.0 | 181.2 | | 33.9 | 39.7 | | |
| 67 | 6.2 | | | 36.2 | 42.4 | | | 230.0 | 231.9 | | 70.2 | 76.6 | | |
| 68 | 10.6 | | | 44.9 | 55.5 | | | 243.7 | 262.0 | | 76.9 | 84.0 | | |
| 69 | 39.9 | | 186.8 | 187.7 | 456.3 | 268.9 | 433.1 | 215.5 | 228.7 | 16.1 | 77.4 | 82.2 | 3.7 | 79.6 |
| 70 | 70.7 | | 182.4 | 164.0 | 323.1 | 114.9 | 262.3 | 93.1 | 88.4 | 11.7 | 68.7 | 66.2 | 4.3 | 68.7 |
| 71 | 53.9 | 54.1 | 19.6 | 80.9 | 80.8 | 97.3 | 161.9 | 70.2 | 70.6 | 12.0 | 53.6 | 54.2 | 3.3 | 53.8 |
| 72 | 17.7 | 17.7 | 88.4 | 134.9 | 135.8 | 495.2 | 195.6 | 53.7 | 54.2 | 13.9 | 68.6 | 72.6 | 1.9 | 72.4 |
| 73 | 283.2 | 283.2 | 117.9 | 100.7 | 100.3 | 261.8 | 153.6 | 36.6 | 39.1 | 9.4 | 63.8 | 70.0 | 0.7 | 68.8 |
| 74 | 320.1 | 320.1 | 348.0 | 26.4 | 26.8 | 116.8 | | 27.4 | 29.1 | 1.2 | 59.0 | 71.8 | 0.7 | |
| Remarks | | | | | Cold included for 1962-70 | Cold sheet strip included | Cold. G. I. included | | Hot sheets included | | | | | |

| | Tin Plates | | | | Galvanized Sheets | | | Flat Products | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | JISF | IISI | BCS | ECE | JISF | IISI | BCS | JISF | IISI | BCS | ECE |
| 1962 | 45.1 | 45.4 | | | 2.5 | 3.8 | | 152.2 | 160.3 | | |
| 63 | 58.1 | 63.2 | | | 5.9 | 6.8 | | 214.9 | 227.1 | | |
| 64 | 40.0 | 44.8 | | | 5.1 | 6.5 | | 258.8 | 266.0 | | |
| 65 | 36.8 | 45.3 | | | 4.0 | 6.5 | | 269.6 | 279.0 | | |
| 66 | 31.9 | 41.3 | | | 2.6 | 4.9 | | 264.5 | 292.2 | | |
| 67 | 41.0 | 44.6 | | | 2.2 | 3.7 | | 386.1 | 399.2 | | |
| 68 | 42.7 | 48.5 | | | 6.6 | 8.3 | | 424.7 | 458.3 | | |
| 69 | 43.2 | 47.9 | 44.9 | 47.4 | 16.2 | 17.9 | 2.4 | 579.9 | 604.3 | 522.8 | 560.1 |
| 70 | 37.5 | 39.8 | 39.4 | 41.8 | 4.5 | 5.6 | 1.9 | 438.5 | 434.7 | 358.3 | 372.8 |
| 71 | 36.4 | 40.0 | 41.4 | 38.5 | 8.3 | 8.3 | 2.5 | 303.3 | 308.0 | 176.1 | 254.2 |
| 72 | 39.1 | 42.7 | 48.1 | 42.7 | 5.0 | 4.6 | 1.9 | 319.0 | 327.6 | 649.4 | 310.7 |
| 73 | 36.7 | 40.6 | 40.2 | 39.2 | 14.7 | 14.5 | 10.9 | 535.7 | 547.7 | 440.9 | 261.6 |
| 74 | 34.4 | 36.6 | 39.0 | | 6.8 | 5.7 | 5.6 | 474.3 | 490.1 | 511.4 | |
| Remarks | | | | | | | | | | | Coils for rerolling excluded |

Sources:
- JISF: World Steel Exports (11 countries)
- IISI: "World Steel Exports" (14 countries)
- ECE: "Statistics of World Trade" (27 to 28 countries)
- BCS: Philippine B.C.S.

(Note) Imports in Table ② utilized IISI statistics. For years no IISI data available JISF and BCS statistics substituted.

## Table ④– (2) Continued

Unit: 1,000 Metric tons

| items / sources / calendar years | Bars | | | | Sections | | | | Wire Rods | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JISF | IISI | BCS | ECE | JISF | IISI | BCS | ECE | JISF | IISI | BCS | ECE |
| 1962 | 7.4 | 15.5 | | | 14.7 | 25.7 | | | 12.7 | 18.3 | | |
| 63 | 11 2 | 25.8 | | | 36.6 | 39.5 | | | 21.9 | 22.6 | | |
| 64 | 28 3 | 34.8 | | | 36.9 | 38.0 | | | 17.0 | 16 9 | | |
| 65 | 28.9 | 35.0 | | | 41.0 | 42.4 | | | 8.4 | 8 3 | | |
| 66 | 29.9 | 37.5 | | | 38.6 | 47.2 | | | 18.2 | 24.8 | | |
| 67 | 20 3 | 27.0 | | | 56.6 | 55 5 | | | 6 2 | 21.5 | | |
| 68 | 22.8 | 28 3 | | | 46 2 | 56 5 | | | 9.1 | 9.0 | | |
| 69 | 21.6 | 24.9 | 27.5 | | 33.6 | 39.6 | 43.8 | 67.6 | 4 0 | 13.7 | 18 1 | 16 1 |
| 70 | 22.9 | 26 5 | 27.3 | 35.7 | 23 5 | 24 2 | 35 1 | 16 9 | 7.0 | 7.4 | 6 8 | 12.0 |
| 71 | 16.7 | 17.8 | 14 1 | 23 8 | 23 5 | 26 5 | 5 2 | 21.9 | 9.7 | 14 5 | 14.6 | 10.1 |
| 72 | 14.5 | 16 2 | 22.5 | 18 2 | 15 3 | 17.3 | 17.4 | 17.7 | 3.7 | 9.9 | 7.9 | 10 1 |
| 73 | 17.8 | 19 1 | 18 8 | 21.5 | 20.7 | 20.6 | 15 9 | 21.0 | 5.5 | 9.6 | 6.7 | 11.8 |
| 74 | 36.2 | 38 1 | 95 8 | | 42 2 | 40 1 | 27.9 | | 15.6 | 22.9 | 20.9 | |
| Remarks | | | | Light Sections | | | | Heavy Sections | | | | |

| items / sources / calendar years | Pipes & Tubes | | | | Wire (Secondary Products) | | | | Total of Steel | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JISF | IISI | BCS | ECE | JISF | IISI | BCS | ECE | JISF | IISI | BCS | ECE |
| 1962 | 11.0 | 15.7 | | | 16 5 | 14.5 | | | 228.5 | 251.6 | | |
| 63 | 21.0 | 22 2 | | | 27.5 | 27.8 | | | 365 1 | 385 1 | | |
| 64 | 20.0 | 21.8 | | | 29.9 | 28.7 | | | 463.4 | 472.9 | | |
| 65 | 25.7 | 28 5 | | | 54 3 | 40 1 | | | 507.9 | 532.5 | | |
| 66 | 29.3 | 25.4 | | | 26 3 | 14.8 | | | 539.9 | 605.6 | | |
| 67 | 39.0 | 38.8 | | | 21.7 | 25.7 | | | 641.9 | 768.7 | | |
| 68 | 42 2 | 43.4 | | | 20 9 | 9 8 | | | 601.9 | 791.4 | | |
| 69 | 30 1 | 33 1 | 31.4 | 33.9 | 18 8 | 9.2 | 11 1 | 7.0 | 729.7 | 1,012.7 | 945.7 | 951.8 |
| 70 | 39.9 | 41 1 | 37.8 | 39.4 | 21.0 | 13 9 | 10.4 | 11.5 | 793.4 | 950.9 | 898.2 | 1,037.2 |
| 71 | 13.8 | 28 8 | 28.5 | 27.9 | 21 2 | 11.7 | 13.6 | 10 1 | 528.7 | 595.0 | 485.8 | 579.1 |
| 72 | ( 83)25.7 | 27.4 | 17.5 | 26 5 | 14.9 | 9.2 | 20 1 | 8.7 | 464.3 | 522.0 | 928.3 | 553.3 |
| 73 | ( 89)10.0 | 37.6 | 26 8 | 38 0 | 22.7 | 15.6 | 17.3 | 13.0 | 665.7 | 774.4 | 659.0 | 787.5 |
| 74 | (118)18.9 | 19.0 | 21 1 | | 34.0 | 21.0 | 17.0 | | 691.1 | 829.6 | 929.0 | |
| Remarks | attachements included ( ) Seamless | | | attachements included | | | | | | | | |

## Table (5) Yield Rates (Source: NSC)

| From \ To | Cold Coils | Hot Coils | Slabs or Billets | Blooms | Crude Steel | Crude Steel philippine | (Reference) Japan (1974) | (Reference) U. N. |
|---|---|---|---|---|---|---|---|---|
| Galvanized Sheets | 1.01 | 1.01 ×1.021 | 1.01×1.021×1.065 | — | 1.01×1.021×1.065 ×1.05 | 1.153 | 1.180 | 1.35 |
| Tin Plates | 1.282 | 1.282×1.021 | 1.282×1.021×1.065 | — | 1.282×1.021×1.065 ×1.05 | 1.464 | 1.180 | 1.35 |
| Cold Rolled Sheets | 1.042 | 1.042×1.021 | 1.042×1.021×1.065 | — | 1.042×1.021×1.065 ×1.05 | 1.190 | 1.188 | 1.35 |
| Cold Rolled Coils | — | 1.021 | 1.021×1.065 | — | 1.21×1.065×1.05 | 1.353 | 1.188 | 1.35 |
| Hot Rolled Sheets | — | 1.053 | 1.053×1.065 | — | 1.053×1.065×1.05 | 1.178 | 1.140 | 1.35 |
| Hot Rolled Coils | — | — | 1.065 | — | 1.065×1.05 | 1.118 | 1.140 | 1.35 |
| Plates | — | — | 1.19 | — | 1.19×1.05 | 1.250 | 1.140 | 1.35 |
| Pipes & Tubes | — | 1.053 | 1.053×1.065 | — | 1.053×1.065×1.05 | 1.178 | 1.222 | 1.20 |
| Bars | — | | 1.11 | 1.11×1.11 | 1.11×1.11×1.05 | 1.294 | 1.107 | 1.20 |
| Wire Rods | — | | 1.11 | 1.11×1.11 | 1.11×1.11×1.05 | 1.294 | 1.137 (Wires1.25) | 1.20 (Wires1.25) |
| S.S.S. | — | — | 1.11 | 1.11×1.11 | 1.11×1.11×1.05 | 1.294 | 1.113 | 1.20 |
| Billets or Slabs | — | — | — | 1.11 | 1.11×1.05 | 1.166 | 1.104 | 1.12 |
| Blooms | — | — | — | — | 1.05 | 1.05 | 1.104 | 1.12 |

Note: References (Japan, UN) show yield rate of ordinary steel

**Diagram (1) GNP and Crude Steel Consumption**

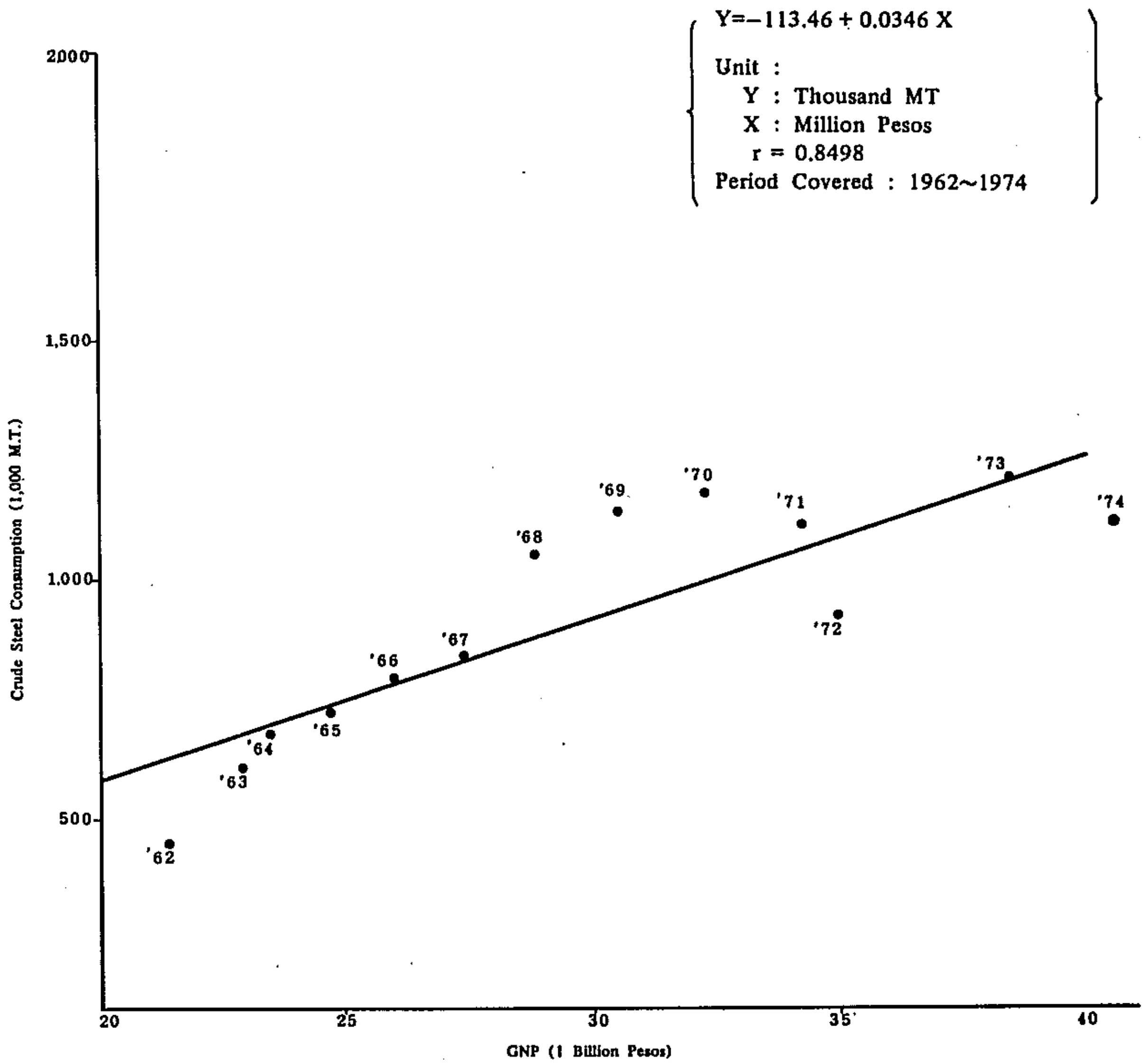
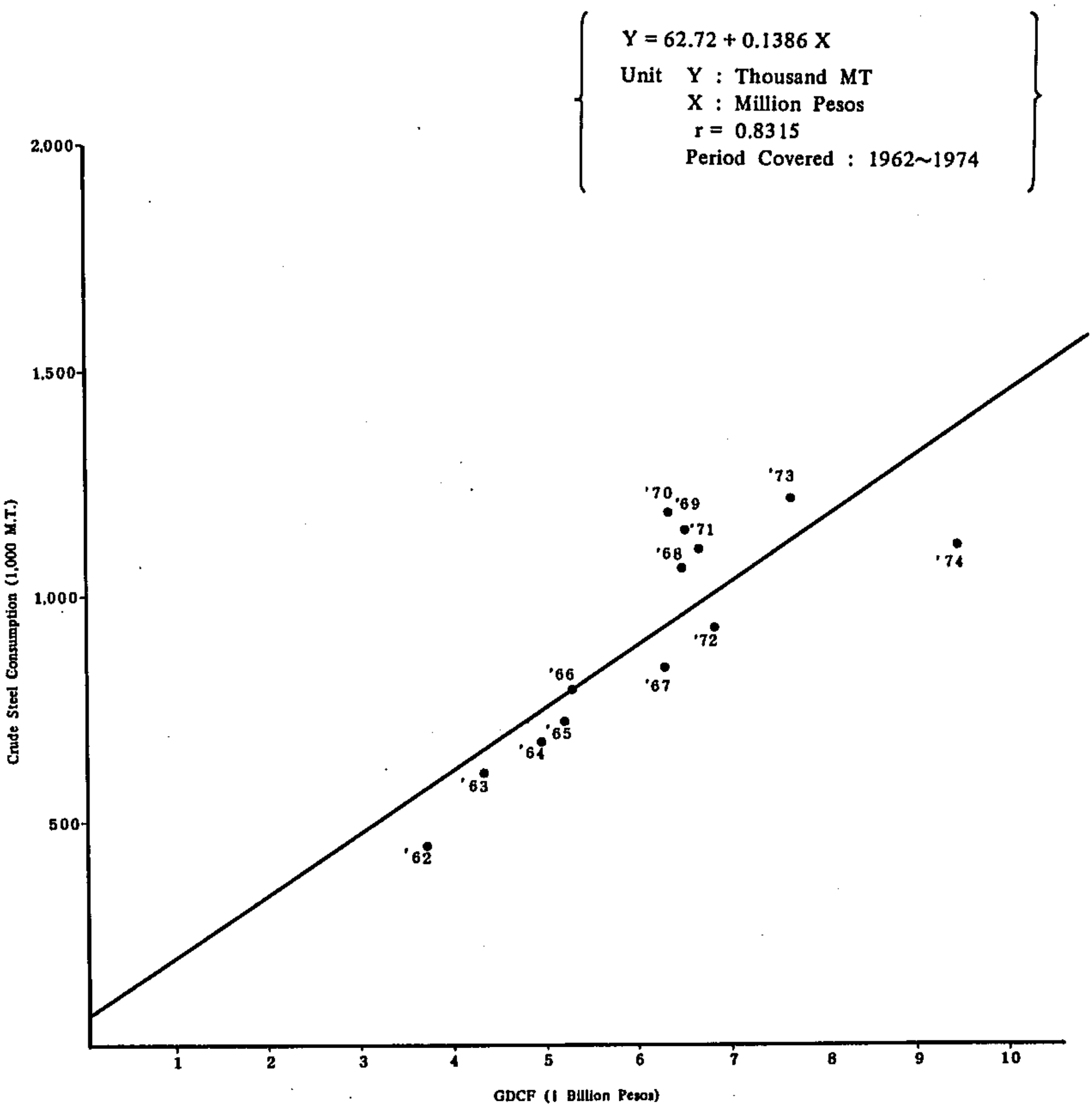


**Diagram (2) GDCF and Crude Steel Consumption**



i) Various types of machinery and equipment, tangible fruit of private plant and equipment investments which are generally expected to stimulate steel demand in the gross national product and the gross domestic capital fromation, are procured more on the foreign market than on the home market in percentage terms, with the result that brisk machinery demand fails, nearly in all cases, to stimulate steel demand;

ii) An analysis of the demand for steel bars and galvanized sheets, of which the weight of consumption is high in the construction sector, in connection with the value of construction investment in the gross national expenditures (1967 prices), revealed that the specific consumption of steel bars and galvanized sheets per construction investment was on the decrease. The downward tendency of the specific consumption per construction investment, the correlation with the macro-economic indicators, such as the gross national product and the gross domestic capital formation, becomes poor when the domestic demand for crude steel is examined, and an alienation results.

## 2–2 Micro-approach analysis

### 2–2–1 Outlines of cumulative estimation by sectors

1) The micro-appraoch forecast is also termed as cumulative estimates by sectors, whereby future steel consumption is estimated for each steel consuming sector.

2) Hence, the emphasis of the work was placed on the examination of economic indicators to find out which indicators would best qualify for employment for the estimation of future steel demand by each steel consuming sector.

3) The estimates of how much future steel demand would grow in the steel consuming sectors in question over the present level could be best computed if data on the present level of economic activities, compiled on a materials basis could be available for each steel consum-

ing sector, meaning, for example, the floor area of housing construction starts, units produced of automobiles, records of shipbuilding starts, records of food can production, etc. It is also important that the kind of forecasting methods which will make possible to grasp the indicators of economic activities in the future years be employed.

4) In case indicators of economic activities are expressed in monetary terms, the constant prices will better serve the purpose than the current prices.

2–2–2 Methods of cumulative estimation by sectors

1) Construction

a) The patterns of sectoral consumption by products are presently available in the Philippines only for 1973. Accordingly, it is difficult to firmly grasp trends in steel consumption by sectors, such as how much steel has been annually consumed by private construction or by public construction.

b) It is possible of course to estimate the trends in consumption by the sectors concerned by referring to the tendency whereby the consumption of certain products concentrates upon certain specific sectors.

c) Incidentally, the largest steel consumer in the Philippines is the construction sector, including fabricators, which consumes about 62 per cent of the nation's total steel consumption.

d) Besides, the construction sector consumes quantities of certain specific steel products. In other words, the consumption of these specific steel products concentrates on this sector.

e) That is to say, quantities of steel bars, galvanized sheets, wire rods and wires, steel pipes and sections are consumed by the construction sector. Reversely, these 5 types of steel products find their largest outlets in the construction sector. (Table⑥)

Table ⑥ Share of Construction Sector in Consumption by Products

(Unit: %)

| | Share of Construction Sector in Consumption by Products | Share by Products in Steel Consumption in Construction Section |
|---|---|---|
| Bars | 95.0 | 43.8 |
| Galvanized Sheets | 90.0 | 20.5 |
| Wire Rods & Wire | 69.0 | 13.0 |
| Pipes & Tubes | 85.0 | 10.5 |
| Sections | 62.0 | 2.2 |
| Sub Total | 86.9 | 90.0 |
| Others | 17.3 | 10.0 |
| Total | 61.9 | 100.0 |

f) Such being the case, it will be possible to regard the trends of steel consumption in the construction sector as those that concern the aggregated volume of these 5 types of steel products.

g) As an indicator of activity in the construction sector we can point out the presence of real term construction investments in the gross national expenditures. An examination of the correlation between the domestic demand for these 5 types of steel products consumed by the construction sector and construction investments produced results as shown in Diagram ③ and Table ⑦. No correlation is observed between the two, contrary to expectations.

h) On the other hand, an analysis of the specific consumption of these 5 items (kg/1,000 pesos) per annual construction investment (1967 prices) clearly showed certain trends as presented in Diagram ④ and Table ⑦. That is to say, the specific consumption of the 5types of steel products (kg/1,000 pesos) per real term construction investment (1967 prices) in the gross national expenditures showed an upward trend from 1962 through 1970 (an increase in steel consumption per construction investment), while it showed a downward trend from 1970 through 1974 (a decrease in steel consumption per construction investment).

This signifies that, in case the value of construction investments is used as an economic indicator in the estimation of future steel demand by the construction sector, steel consumption in the construction sector can not be expected to expand so much as the value of construction investments, should be downward trend in the specific steel consumption per construction investment continue into future years. In other words, it should be noted that there is a possibility that the expansion of steel consumption will be smaller than that of construction investments.

2) Cans and containers

a) When it concerns the sector of food cans, milk production was adopted as the indicator of activity for the estimation of future growth of food can production as the trends in food can production were not clear in statistical terms. The adoption of this was due to the fact that milk cans are relatively in great demand in the Philippines, compared with other types of food cans. (The 1973 consumption pattern showed a share of nearly 50 per cent).

Taking this as a most reliable means of estimating milk production, a few analyses were attempted. As a result, it was concluded on the basis of the past trends, that personal consumption expenditures in the gross national product would better serve as a variable of

Table ⑦ Trends in Domestic Demand for 5 Types of Consturction–related Products and Trends in Construction Investments (GDCF) and Specific Consumption

| | Domestic Demand for 5 Types of Construction-related Products | | | | | | Construction Investments (GDCF) (million pesos) | Specific Consumption (Kg/1000 pesos) |
|---|---|---|---|---|---|---|---|---|
| | Galvanized Sheets | Bars | Wire Rods | Sections | Pipes & Tubes | Total (1,000 MT) | | |
| 1962 | 82.6 | 110.8 | 38.8 | 25.7 | 19.7 | 277.6 | 1,387 | 200 |
| 63 | 94.7 | 135.0 | 56.7 | 39.5 | 26.2 | 352.1 | 1,702 | 207 |
| 64 | 110.5 | 163.4 | 52.6 | 38.0 | 30.5 | 395.0 | 1,861 | 212 |
| 65 | 126.4 | 167.8 | 62.2 | 42.4 | 40.1 | 438.9 | 2,076 | 212 |
| 66 | 120.2 | 203.8 | 65.5 | 47.2 | 38.5 | 475.2 | 2,014 | 236 |
| 67 | 136.2 | 220.6 | 97.2 | 55.5 | 56.4 | 565.9 | 2,257 | 251 |
| 68 | 145.2 | 212.3 | 86.2 | 56.5 | 66.6 | 566.8 | 2,038 | 278 |
| 69 | 169.5 | 221.4 | 105.0 | 39.6 | 55.9 | 591.4 | 2,290 | 258 |
| 70 | 143.2 | 228.1 | 84.2 | 24.2 | 59.1 | 538.8 | 1,781 | 303 |
| 71 | 122.3 | 248.6 | 101.7 | 26.5 | 57.5 | 556.6 | 1,866 | 298 |
| 72 | 136.6 | 260.8 | 95.5 | 18.3 | 50.4 | 561.6 | 2,367 | 237 |
| 73 | 135.8 | 275.6 | 112.4 | 21.1 | 74.1 | 619.0 | 2,473 | 250 |
| 74 | 87.3 | 280.6 | 79.1 | 40.1 | 50.6 | 537.7 | 2,622 | 205 |

Source of Consturction investments (GDCF): NEDA

**Diagram ③ Construction Investments and Aggregate of construction–related 5 items (Domestic Demand)**

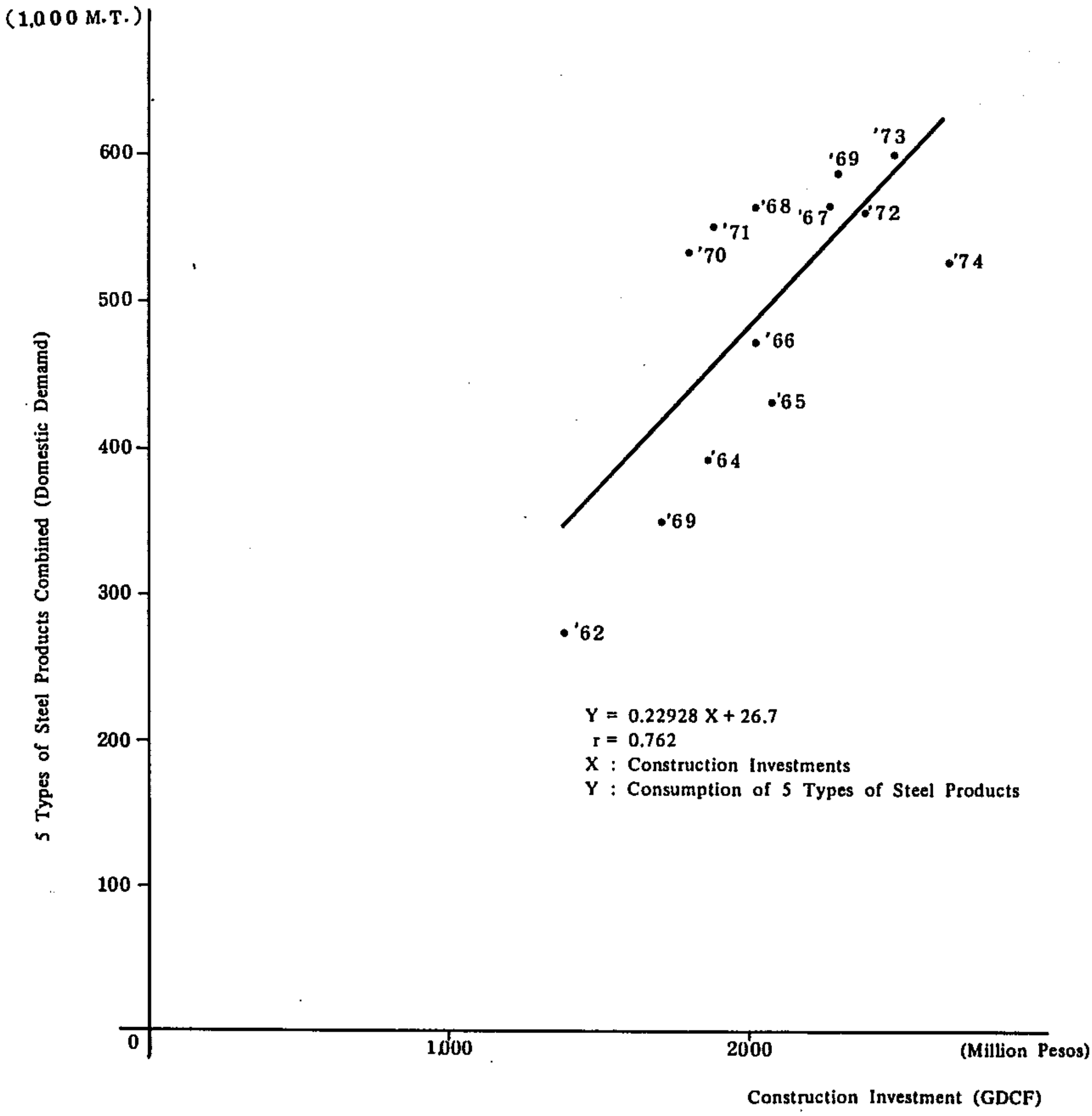
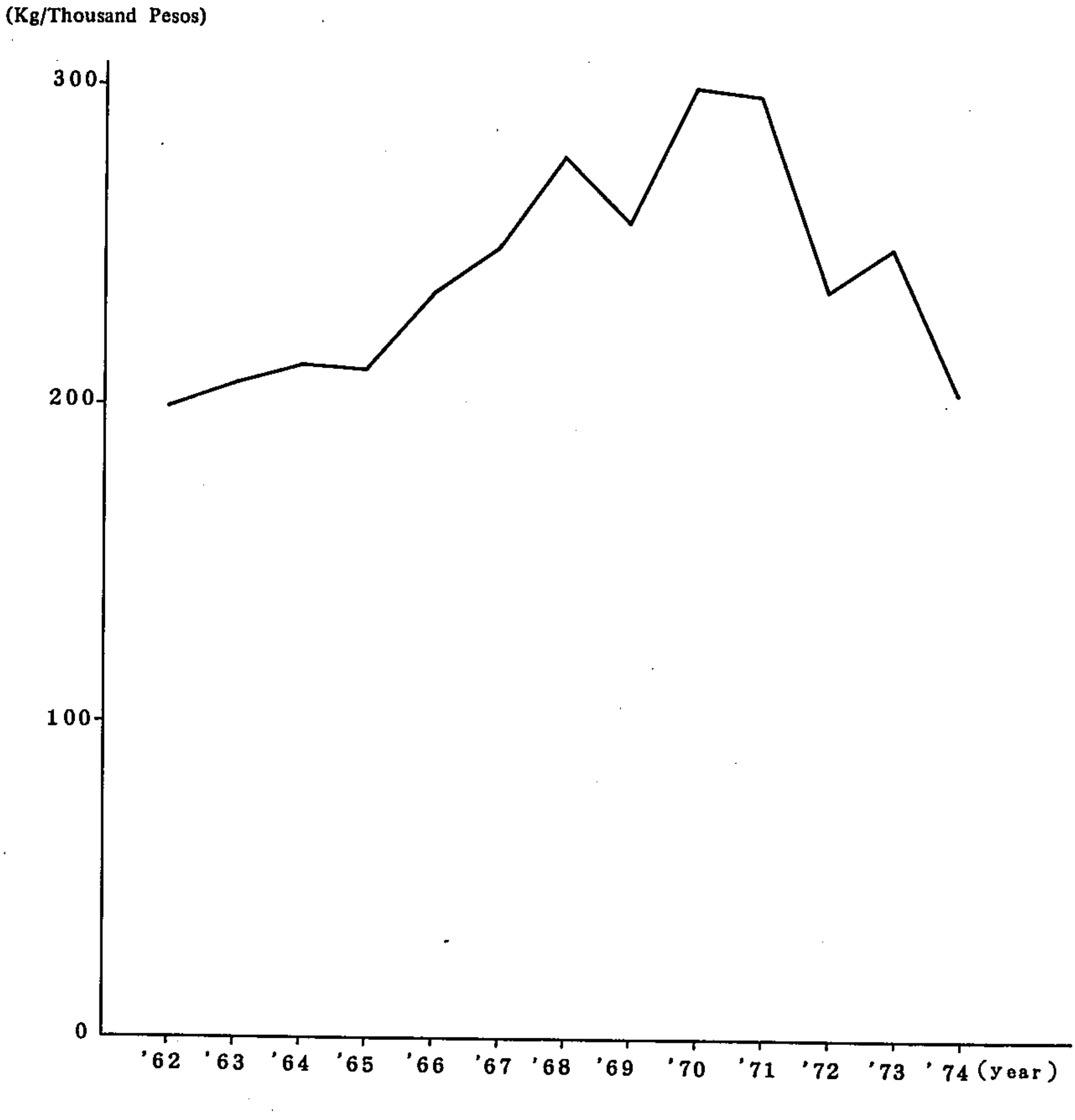


Diagram (4) Trends in Specific Consumption of Aggregate of 5 Types of Products for Construction per Construction Investment



explanation in the estimation of milk production than the future growth rate of population.

That is to say, the analysis of milk production from 1964 through 1973 in correlation with personal consumption expenditures in the gross national product (1967 prices) confirmed an extremely high degree of correlation, as shown in Diagram ⑤ and Table ⑧.

$$Y = 8.1306\,X - 73{,}816.0 \qquad r = 0.982$$

Y = milk production (Kg); X = personal consumption expenditures (Million Pesos)

b) Compared with food cans, uses of other cans and containers are much more extensive. Above all, the industrial use is dominant. Such being the case, the index of industrial production was used as an indicator of the level of activity.

Incidentally, the index of industrial production was estimated in correlation with production by the manufacturing industry in the gross national product (1967 prices), as shown in Diagram ⑥.

$$Y = 0.0238\,X + 12.2 \qquad r = 0.993$$

Y = index of industrial production (1965 = 100)

X = production by the manufacturing industry in the gross national product (1967 prices)

3) Automobiles

a) As for demand estimates in the automotive sector, the units produced of automobiles or the units sold can naturally be considered as an indicator of activity. Here, the units sold were employed as the activity indicator in working out demand estimates. (Table ⑨)

b) As a method of estimating production or sales of automobiles serving as an activity indicator, it is common to compute estimates by analysing, as for automobiles, i) the relations between the per capita national income and the growth of automobile ownership, and ii) the relations between personal consumption expenditures in the gross national product and the units sold of new automobiles, and, as for trucks, i) the relations between the growth of the GNP and the growth of truck ownership, and ii) the relations between private plant and equipment investments and the units sold of new trucks, etc. However, the units sold compiled in the 1977–1980 projections prepared by the A.M.I.I. in the Philippines were taken as they are as indicative of activities, and steel demand was estimated on this basis, as shown in Table ⑩ .

c) Data obtained from other sources (statistics compiled by the Japan Automotive Industrial Association) were consulted to compare the period of demand increases and growth trends in countries as Venezuela, Brazil, Spain, not to mention Japan, and to check whether the figures in the A.M.I.I. projections were reasonable or not. The results are as shown in Table ⑪ . While it all depends on the degree of future economic growth in the Philippines, this much expansion in demand can be highly possible, judging from the current scale of automobile demand in the Philippines and also from the trends in these countries toward increased production.

d) In case estimates computed by professional instituttions, such as this, are available, they should certainly be utilized effectively. Needless to say, however, it is imperative to excercise due discretion to avoid indiscretion in the utilization of such data and to check them to the maximum extent possible prior to putting to use.

e) The automobile production in the Philippines is generally produced on a complete knockdown basis at present, and automotive parts requirements are supplied by overseas sources. However, accompanying improvement in the share of domestic production, the share of domestic supply of automotive parts can be expected to increase in the future, and so will rise the specific consumption of domestic steel. Be that as it may, the estimation this time assumed the basic unit as it stands today.

**Diagram (5) Milk Production and Personal Consumption Expenditures**

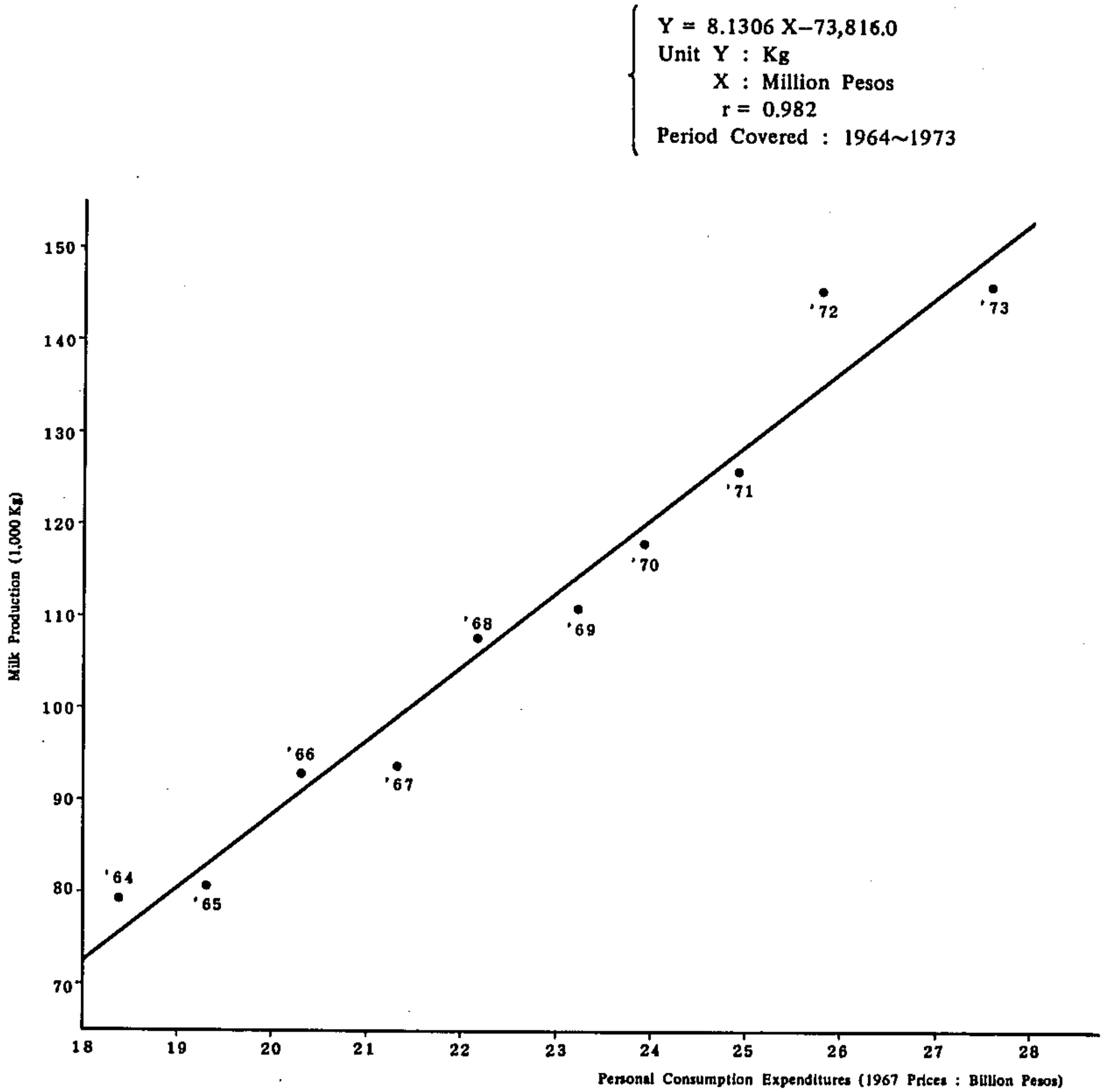


Diagram (6) Index of Industrial Production and Production by Manufacturing Industry.

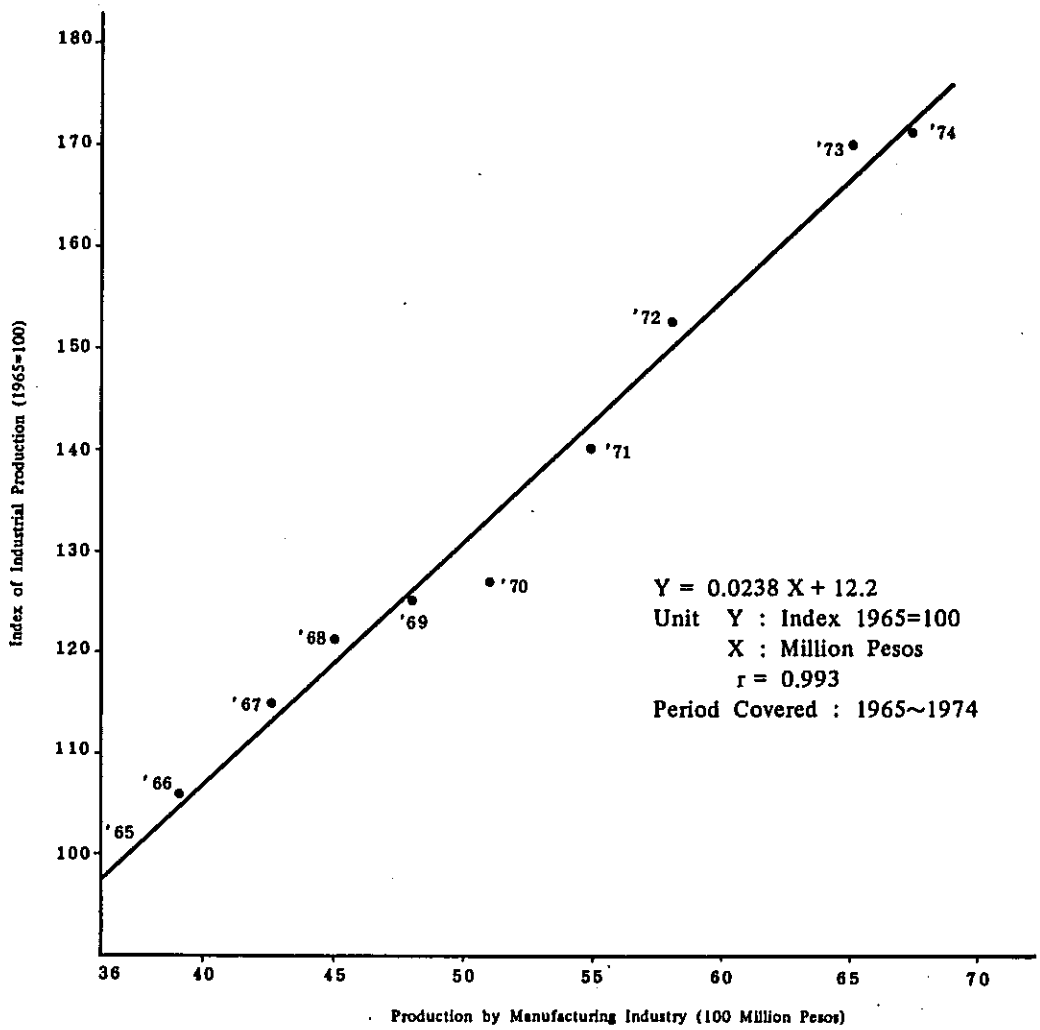


Table ⑧ Milk Production and personal Consumption Expenditures

| | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Milk Production (Kg) | 79.565 | 80.665 | 93.221 | 94.000 | 108.583 | 111.565 | 118.655 | 126.542 | 145.598 | 146.555 | |
| Personal Consumption (1967 Prices; Million Pesos) | 18.408 | 19.319 | 20.313 | 21.276 | 22.146 | 23.178 | 23.872 | 24.897 | 25.735 | 27.545 | (29.214) |

Source: Materials supplied by the Philippine Side

$Y_1$ : *Milk Production*

$X_1$ : Personal Consumption Expenditures

$Y_1 = 8.1306 x_1 - 73,8160$ $r=0.982$

Table ⑨ Industrial Production Index and production by Manufacturing Industries

| | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|---|
| Index of Industrial Production (1965=100) | 100 | 106.7 | 115.7 | 121.5 | 125.1 | 127.0 | 140.5 | 153.6 | 170.5 | 171.8 |
| Production by Manufacturing Industries (1967 Prices; Million Pesos) | 3.672 | 3.911 | 4274 | 4.570 | 4.811 | 5.108 | 5.497 | 5.828 | 6.527 | 6.755 |

Source: Philippine Central Bank (Index of industrial Production), NEDA (Production by Manufacturing Industries)

Y : Index of Industrial Production

X : Production by Manufacturing Industry in GNP

$Y = 0.0238 x + 12.2$ $r = 0.993$

Table ⑩ Domestic Sales of Automobiles (Domestic Demand)

| | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Passenger Cars | 10,238 | 11,528 | 12,166 | 14,641 | 17,509 | 17,149 | 7,375 | 9,651 | 11,994 | 16,737 | 21,844 |
| Trucks | 7,389 | 5,767 | 6,291 | 6,986 | 8,515 | 10,042 | 8,823 | 11,219 | 9,522 | 15,534 | 22,303 |
| Total | 17,627 | 17,295 | 18,457 | 21,627 | 26,024 | 27,191 | 16,198 | 20,870 | 21,516 | 32,271 | 44,147 |

(Note): A.M.I.I. projections for 1977 – 1980
Source: Mateirals supplied by the Philippine Side (LTC & TAA)

## Table (11) Trends in Automotive Production in Major Countries

| Sweden (Year) | Sweden | Japan (Year) | Japan | Venezuela (Year) | Venezuela | Brazil (Year) | Brazil | Spain (Year) | Spain | The Philippines(planned) (Year) | The Philippines(planned) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Passenger Cars and Trucks Combined** | | | | | | | | | | | |
| 1952 | 21,233 | 1950 | 31,597 | 1963 | 24,052 | 1957 | 30,542 | 1956 | 22,215 | 1972 | 21,516 |
| 53 | 29,427 | 51 | 38,490 | 64 | 44,974 | 58 | 60,983 | 57 | 30,436 | 73 | 32,271 |
| 54 | 44,735 | 52 | 38,966 | 65 | 58,392 | 59 | 96,114 | 58 | 31,050 | 74 | 44,147 |
| 55 | 50,299 | 53 | 49,778 | 66 | 60,502 | 60 | 133,041 | 59 | 56,800 | 75 | 60,750 |
| 56 | 57,274 | 54 | 70,073 | 67 | 58,045 | 61 | 145,584 | 60 | 58,209 | 76 | 72,860 |
| 57 | 71,654 | 55 | 68,932 | 68 | 62,868 | 62 | 191,194 | 61 | 75,000 | 77 | 87,500 |
| 58 | 91,179 | 56 | 111,066 | 69 | 73,061 | 63 | 174,191 | 62 | 100,163 | 78 | 103,000 |
| 59 | 112,394 | 57 | 181,977 | 70 | 69,976 | 64 | 183,707 | 63 | 131,988 | 79 | 119,140 |
| 60 | 128,527 | 58 | 188,303 | 71 | 79,608 | 65 | 185,187 | 64 | 178,128 | 80 | 135,700 |
| 61 | 131,755 | 59 | 262,814 | 72 | 88,674 | 66 | 224,574 | 65 | 225,462 | | |
| 62 | 151,568 | 60 | 481,551 | 73 | 96,951 | 67 | 225,418 | 66 | 340,418 | | |
| 63 | 167,850 | 61 | 813,879 | | | 68 | 278,473 | 67 | 362,906 | | |
| **Passenge Cars** | | | | | | | | | | | |
| 1952 | 10,529 | 1953 | 8,789 | 1965 | 40,783 | 1959 | 11,963 | 1956 | 20,300 | 1972 | 11,994 |
| 53 | 19,176 | 54 | 14,472 | 66 | 43,351 | 60 | 37,818 | 57 | 27,800 | 73 | 16,737 |
| 54 | 28,564 | 55 | 20,268 | 67 | 41,971 | 61 | 54,978 | 58 | 22,150 | 74 | 21,844 |
| 55 | 33,140 | 56 | 32,056 | 68 | 44,315 | 62 | 74,887 | 59 | 53,600 | 75 | 26,500 |
| 56 | 37,849 | 57 | 47,121 | 69 | 52,332 | 63 | 86,024 | 60 | 39,732 | 76 | 32,860 |
| 57 | 52,367 | 58 | 50,643 | 70 | 50,042 | 64 | 97,768 | 61 | 55,000 | 77 | 40,000 |
| 58 | 77,182 | 59 | 78,598 | 71 | 57,295 | 65 | 103,415 | 62 | 62,559 | 78 | 48,000 |
| 59 | 96,975 | 60 | 165,094 | 72 | 63,783 | 66 | 120,119 | 63 | 79,154 | 79 | 56,640 |
| 60 | 110,010 | 61 | 249,508 | 73 | 65,909 | 67 | 132,027 | 64 | 119,327 | 80 | 65,700 |
| 61 | 111,619 | 62 | 268,784 | | | 68 | 160,654 | 65 | 159,145 | | |
| **Trucks** | | | | | | | | | | | |
| 1952 | 9,256 | 1950 | 26,501 | 1965 | 17,609 | 1957 | 30,044 | 1958 | 8,900 | 1972 | 9,522 |
| 53 | 9,002 | 51 | 30,817 | 66 | 17,151 | 58 | 58,136 | 59 | 3,200 | 73 | 15,534 |
| 54 | 14,569 | 52 | 29,960 | 67 | 16,074 | 59 | 82,844 | 60 | 18,477 | 74 | 22,303 |
| 55 | 15,377 | 53 | 36,147 | 68 | 18,553 | 60 | 93,327 | 61 | 20,000 | 75 | 34,250 |
| 56 | 17,515 | 54 | 49,852 | 69 | 20,729 | 61 | 88,991 | 62 | 37,604 | 76 | 40,000 |
| 57 | 17,339 | 55 | 43,857 | 70 | 19,934 | 62 | 115,380 | 63 | 52,834 | 77 | 47,500 |
| 58 | 11,583 | 56 | 72,958 | 71 | 22,313 | 63 | 86,988 | 64 | 58,801 | 78 | 55,000 |
| 59 | 13,716 | 57 | 126,820 | 72 | 24,891 | 64 | 83,694 | 65 | 66,317 | 79 | 62,500 |
| 60 | 16,222 | 58 | 130,066 | 73 | 31,042 | 65 | 79,466 | 66 | 93,412 | 80 | 70,000 |

Source: Japan Automotive Industrial Association

4) Appliances

a) Demand forecast for the appliances sector should in principle be based on a full analysis of i) the relations between per capita national income and the rate of home appliances diffusion, and of ii) the relations between personal consumption expenditures in the GNP and records of application or sales records.

Attempts have been made to approach from this standpoint. However, due to restrictions on the availability of data required, the units produced of 2 representative items, namely refrigerators and airconditioners, were employed as an indicator of activity in the home appliances sector.

b) The estimates of the units of refrigerators and airconditioners to be produced in the future were computed on the basis of regression of time series for the records of refrigerator and airconditioner production from 1969 through 1973, as shown in Table ⑫.

5) Fabricators

As for demand for fabricators, the weight of consumption in the construction sector being high, construction investments (1967 prices) in the GNP were employed, just as in the case of the construction sector, as an indicator of activity. (Table ⑬ )

6) Shipbuilding

Records of ships commenced or completed should have been employed as an indicator of activity in the shipbuilding sector. However, due to limitations in terms of the availability of statistical data, the indicator for this sector was considered only in the context of the analysis of fabricators.

7) Agriculture

The index of agricultural production was employed as an indicator of activity in the agricultural sector, as shown in Table ⑭.

8) Other manufacturing industries

The index of industrial production was employed as in the case of other cans and containers, as an indicator of activity in other manufacturing industries.

9) Dealers

It was difficult to select a specific indicator to signify the level of activity on the part of dealers. However, since dealers are associated with every one of the steel consuming sectors, the combined growth rate of all sectors from construction to other manufacturing industries was used as an indicator.

2–2–3 For reference

In parallel with the analysis of steel consumption in the construction sector, studies were made of the relations between the trends in consumption and the indicators of activity, focusing attention on some representative products. The results obtained were not utilized directly in working out the forecast. However, since it is highly possible that these can be of reference in the analysis of stagnation of steel demand in recent years and in devising a more refined appraoch to forecasting in the days ahead, mention will be made in general terms of the findings about bars and galvanized sheets of which the weight of consumption is particularly heavy in the construction sector.

1) Bars

The indicator of activities in the private and public construction sectors can be represented by construction investments. Hence, the correlation between bar demand and construction investments was examined, and it was found as shown in Diagram ⑦ and Table ⑮ that it is weak, just as in the case of the 5 products mentioned earlier.

Next, an examination was made of the specific consumption of bars per annual construction investment (bar demand expressed in terms of kg/1,000 pesos), of which the findings are given in Diagram ⑧ and Table ⑮ . Apparently, a tendency is noted. That is to say, the specific consumption of bars per construction investment has been on the decrease since 1972, and, just as in the case of the 5 products, bar consumption, meaning demand, increased less in comparison with the growth of construction investment. Such being the case, an interpretation is possible that it constitutes one of the reasons why there has been no coordination since 1970 between the macro-economic indicator and domestic demand for crude steel.

2) Galvanized sheets

Demand for galvanized sheets is mostly generated by private construction investments. Therefore, it can be expected that there should be a relation in statistical terms between the demand and the floor area of construction starts of private residential and private non-residential buildings. An examination was made, against this background, of the specific consumption of galvanized sheet per floor area of annual construction starts (kg/1,000 $m^2$). And relative stability was noted as shown in Diagram ⑨ , except for 1974. The value of private construction investments per floor area of construction starts has been on the increase as shown in Diagram ⑩ . Refer also to Table 16 . That is to say, it tends to cost more year after year to build the same floor area. It signifies that galvanized sheet consumption, meaning demand, too, increased less in comparison with the growth of private construction investments. And it is considered as a reason for the gap between the macroeconomic indicator and domestic demand for crude steel, just as in the case of bars. Accordingly, in case it is difficult to obtain the value of floor area of construction starts which should serve as available of explanation in making forecasts, it would be possible to substitue by the value of private construction investments. In case this is done, it will be necessary to make either upward or downward modifications to the demand estimates calculated on the basis of the increment of investments, taking into consideration, as mentioned earlier, private construction investments per floor area of construction starts or the trends in, and characteristics of, the specific consumption of galvanized sheet per private construction investment. The results of the analysis showing a downward trend in the specific consumption per investment, downward modifications will be appropriate.

### Table ⑫ Output of Refrigerators and Air-conditioners

| | 1969 | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|---|
| Units Produced | 46,843 | 47,861 | 67,254 | 89,254 | 111,105 |

Source: MIRDC (Metal Working Industry of Philippines)
Y = 17,028.8 X + 21,451.2  r = 0.971

Y : Refrigerators and air-conditioners produced
X : Years (time series) (Year x-Year 1969+1)

### Table ⑬ Indicator of Fabricator Activities

| | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|---|
| Construction Investments (GDCF) (1967 Prices; Million Pesos) | 2,076 | 2,014 | 2,257 | 2,038 | 2,290 | 1,781 | 1,866 | 2,367 | 2,473 | 2,622 |

(Note): Private Construction Investments + Public Construction Investments
Source: NEDA

### Table ⑭ Level of Agricultural Activities

| | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|
| Index of Agricultural Production (1965=100) | 106.0 | 109.6 | 123.1 | 123.1 | 132.3 | 134.9 | 133.1 | 136.6 | 142.2 |

Source: Philippine Central Bank

**Diagram ⑦ Consturction Investments and Bar Consumption (Domestic demand)**

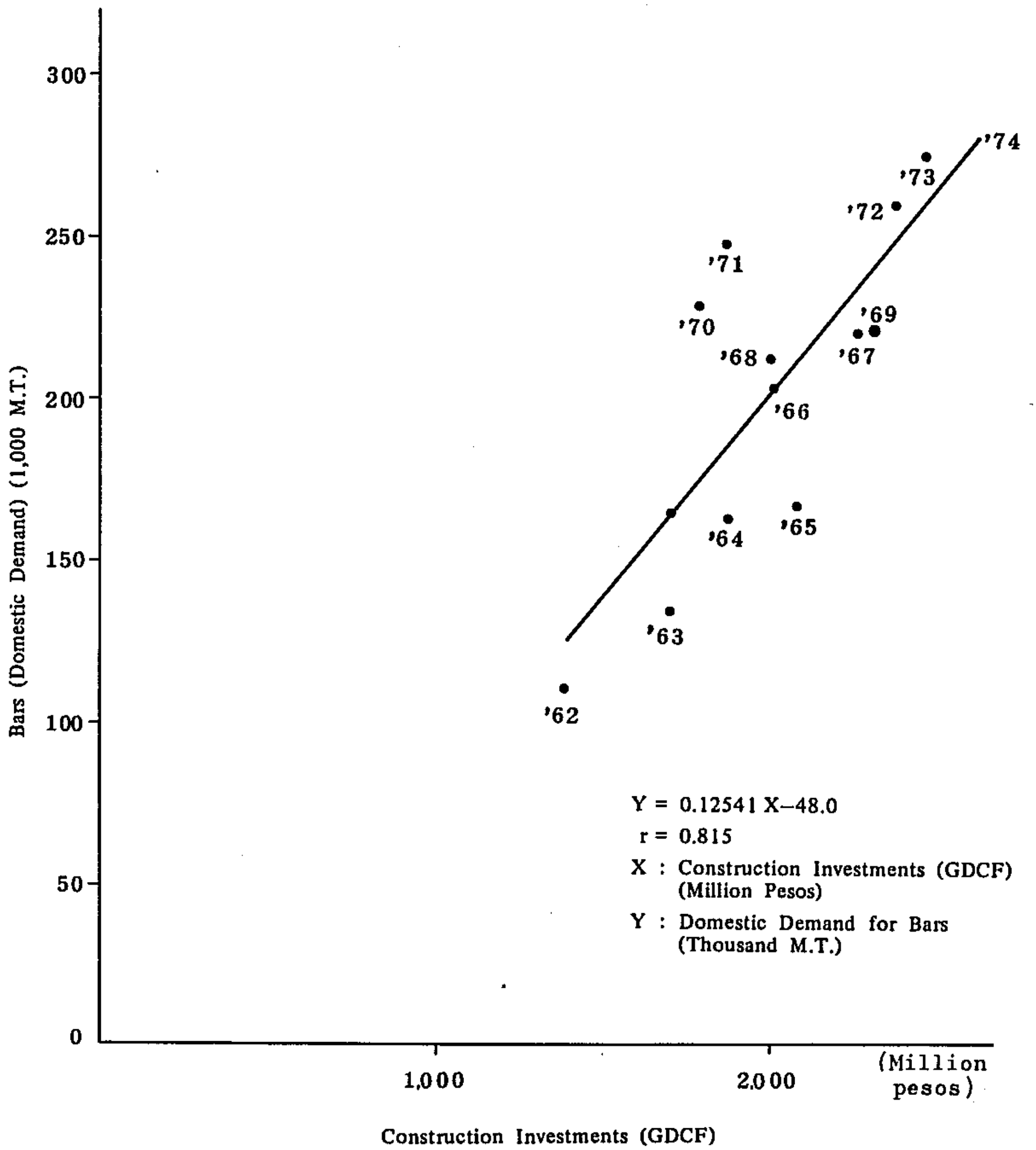


Diagram (8) Trends in Specific Consumption of Bars per Construction Investment

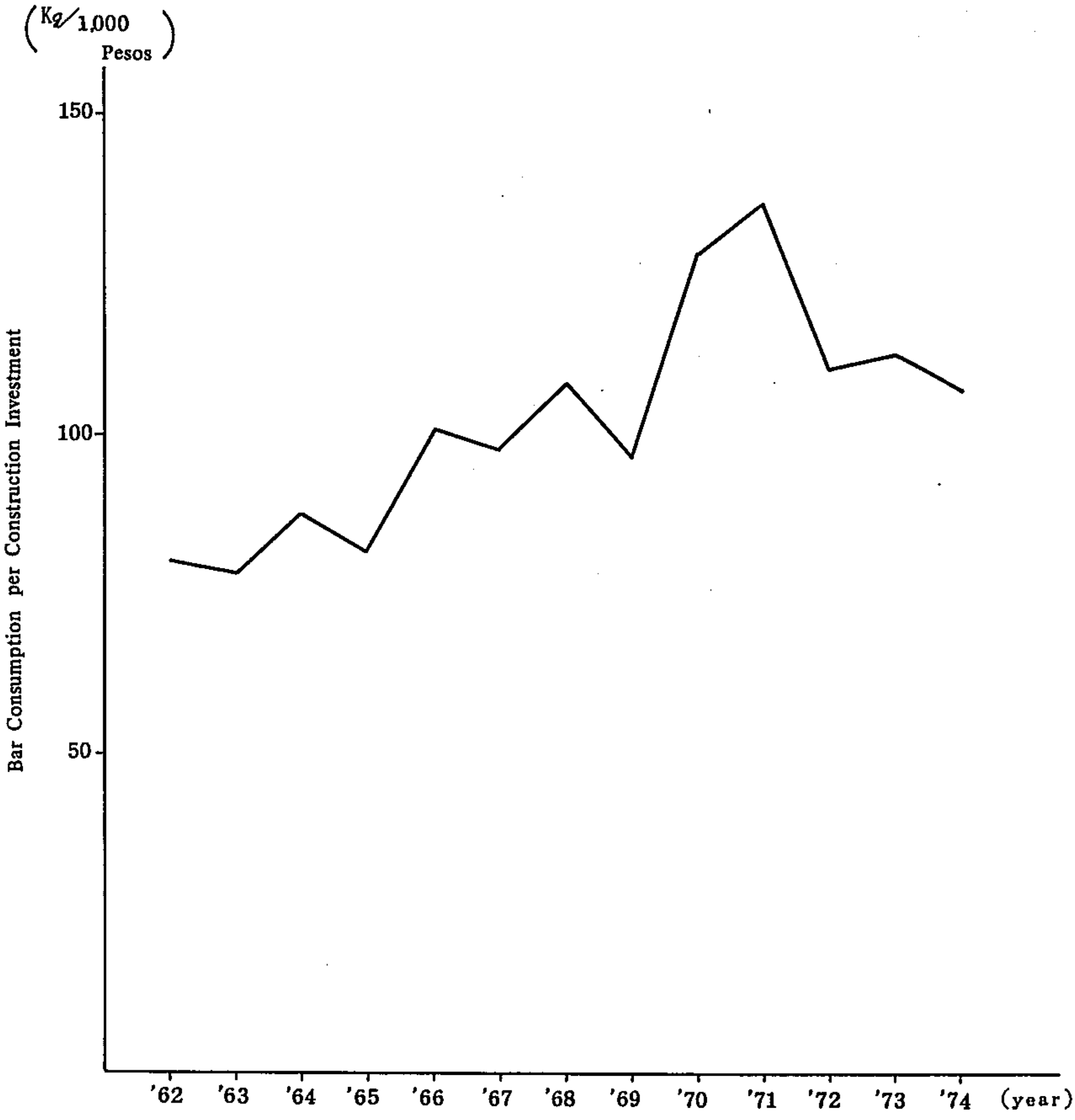


Table (15) Trends in Domestic Demand for Bars and Trends in Construction Investments (GDCF) and Specific Consumption of Bars

| | Bars (Dmestic Demand) (1,000 Metric Tons) | Construction Investments (GDCF) (Million Pesos) | Specific Consumption Bars per Construction Investments (Kg/1,000 Pesos) |
|---|---|---|---|
| 1962 | 110.8 | 1,387 | 80.0 |
| 63 | 135.0 | 1,702 | 79.3 |
| 64 | 163.4 | 1,861 | 87.8 |
| 65 | 167.8 | 2,076 | 80.8 |
| 66 | 203.8 | 2,014 | 101.2 |
| 67 | 220.6 | 2,257 | 97.7 |
| 68 | 212.3 | 2,038 | 104.2 |
| 69 | 221.4 | 2,290 | 96.7 |
| 70 | 228.1 | 1,781 | 128.1 |
| 71 | 248.6 | 1,866 | 133.2 |
| 72 | 260.8 | 2,367 | 110.2 |
| 73 | 275.6 | 2,473 | 111.4 |
| 74 | 280.6 | 2,622 | 107.0 |

Source: Construction Investments (GDCF) : (NEDA)

Table (16) Trends in Demestic Demand for Galvanized Sheets and Trends in Construction-related Indicators and Specific Consumption

| | Domestic Demand for Galvanized Sheets (1000 Metric tons) | Floor Area of Private Construction Starts (1000 $m^2$) | Private Construction Investments (Million Pesos) | Specific Consumption of Galvanized Sheets per Floor Area of Construction Starts (Kg/1000 $m^2$) | Private Construction Investment per Floor Area of Construction Starts (Pesos/$m^2$) |
|---|---|---|---|---|---|
| 1966 | 120.2 | 2,793 | 1,486 | 43.0 | 532 |
| 67 | 136.2 | 3,220 | 1,610 | 42.3 | 500 |
| 68 | 145.2 | 3,039 | 1,428 | 47.8 | 470 |
| 69 | 169.5 | 2,994 | 1,386 | 56.6 | 463 |
| 70 | 143.2 | 2,899 | 1,354 | 49.4 | 467 |
| 71 | 122.3 | 2,476 | 1,281 | 49.4 | 517 |
| 72 | 136.6 | 2,746 | 1,462 | 49.7 | 537 |
| 73 | 135.8 | 2,655 | 1,486 | 51.1 | 560 |
| 74 | 87.3 | 2,477 | 1,545 | 35.2 | 624 |

Source: Floor Area of Private Construction Starts (UN, Journal of Philippine Statistics)

Diagram ⑨. Trends in Specific Consumption of Galvanized Sheets per Floor Area of Construction Starts

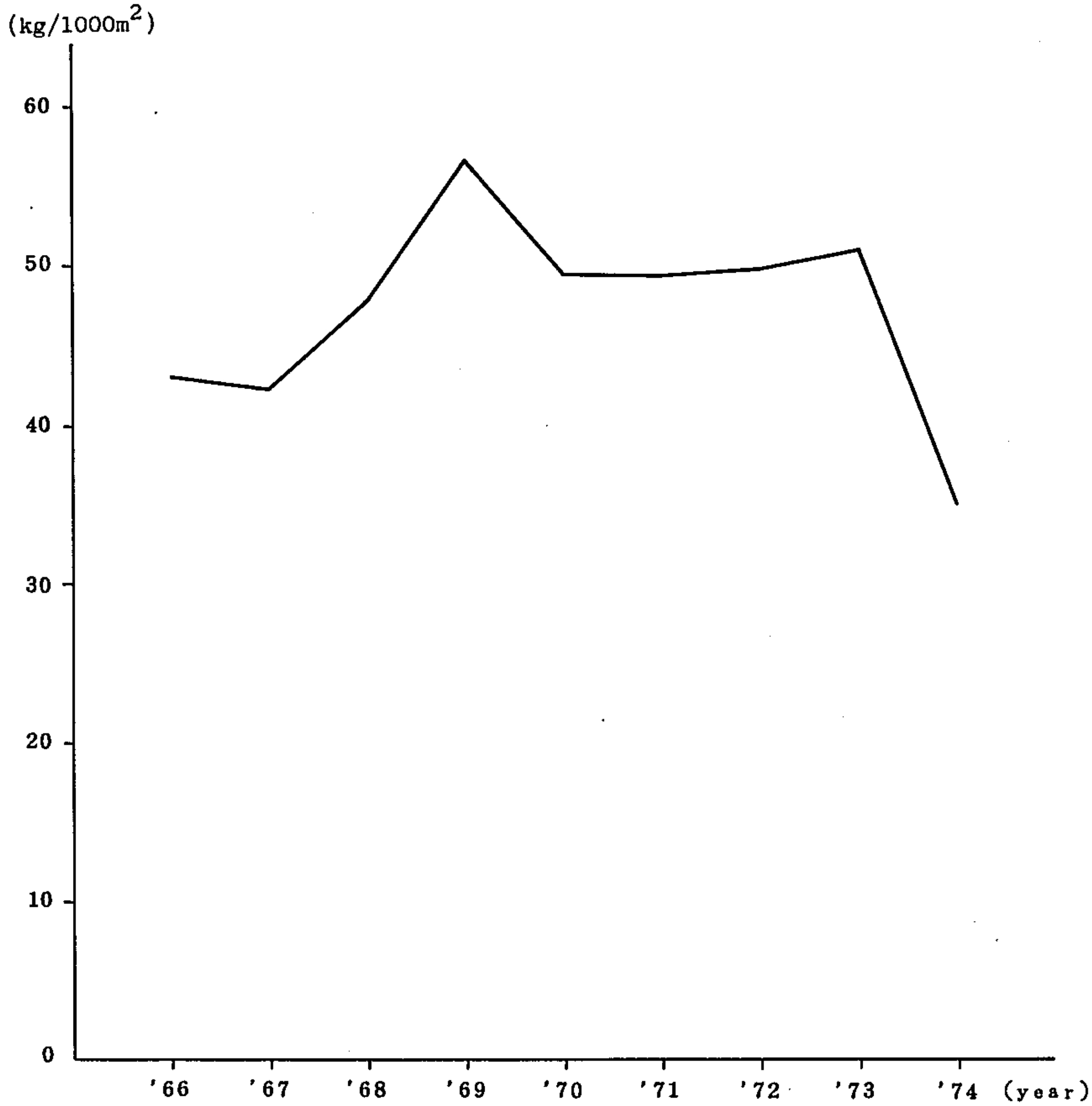
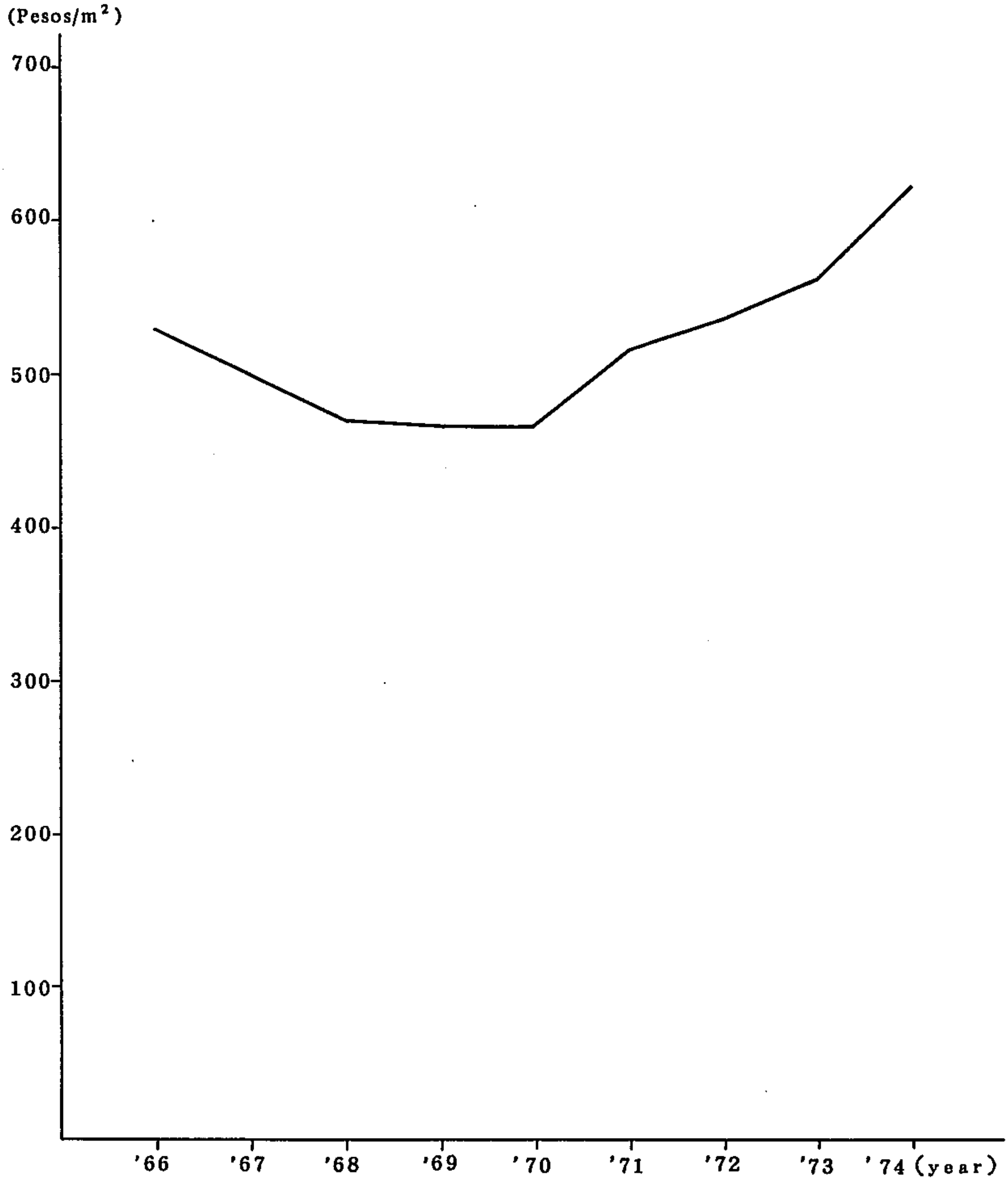


Diagram ⑩ Trends in Private Construction Investments per Floor Area of Construction Starts



## III Steel demand forecast

1) Observations will be made, on the basis of the findings so far, on the forecasting of what the future has in store.

2) As was learned in the Chapter II on analysis, steel demand is under a spell of influence of the growth of the gross national product or of that of the gross domestic capital formation. However, one and the same growth rate of the GNP or of the GDCF can produce changes in steel demand depending on the varied components.

3) In the absence of official announcement of any economic plans for 1980 or for the dates further beyond, steel demand was estimated according to several cases which assumed as follows: (Table ⑰)

Case A: Every component of the GNP would maintain the same growth rate through 1980 as for 1973–1977;

Case B: The growth rate of Case A would drop by 10 per cent in 1973–1980;

Case C: The same GNP growth rate as in Case A and the same distribution ratio for every component as in 1977;

Case D: The same GNP growth rate as in Case A but the same distribution ratio for individual components as in 1974.

4) Demand estimates by macro-approach

As pointed out in Chapter II, the macro-approach estimates of domestic demand for crude steel in the GNP or in the GDCF present problems since the coefficient of correlation shows poor performance. Nevertheless, the macro appraoch was employed to estimate domestic demand for crude steel in 1980. The results obtained are as shown in Diagrams ⑪ and ⑫ and Table ⑱ . As noted, domestic demand for crude steel in 1980, on the basis of the

GNP, was estimated at 1,958,000 tons for Cases A, C and D and 1,872,000 tons for Case B, the former showing the same GNP value, while, on the basis of the GDCF, the figure was largest for Case D at 1,991,000 tons, while it was lowest for Case C at 1,835,000 tons.

5) Demand estimates by micro-appraoch (accumulation by sectors)

This approach assumed 4 cases as in the foregoing section. The Case A assumptions were applied to Cases C and D when it concerned the automotive and home appliances sectors. It should in principle be possible that both automotive sales and home appliances sales change accompanying changes in personal consumption expenditures. This having been bypassed in computing estimates, changes in steel demand resulting from changes in the weight of individual components of the gross national product were not necessarily reflected in full.

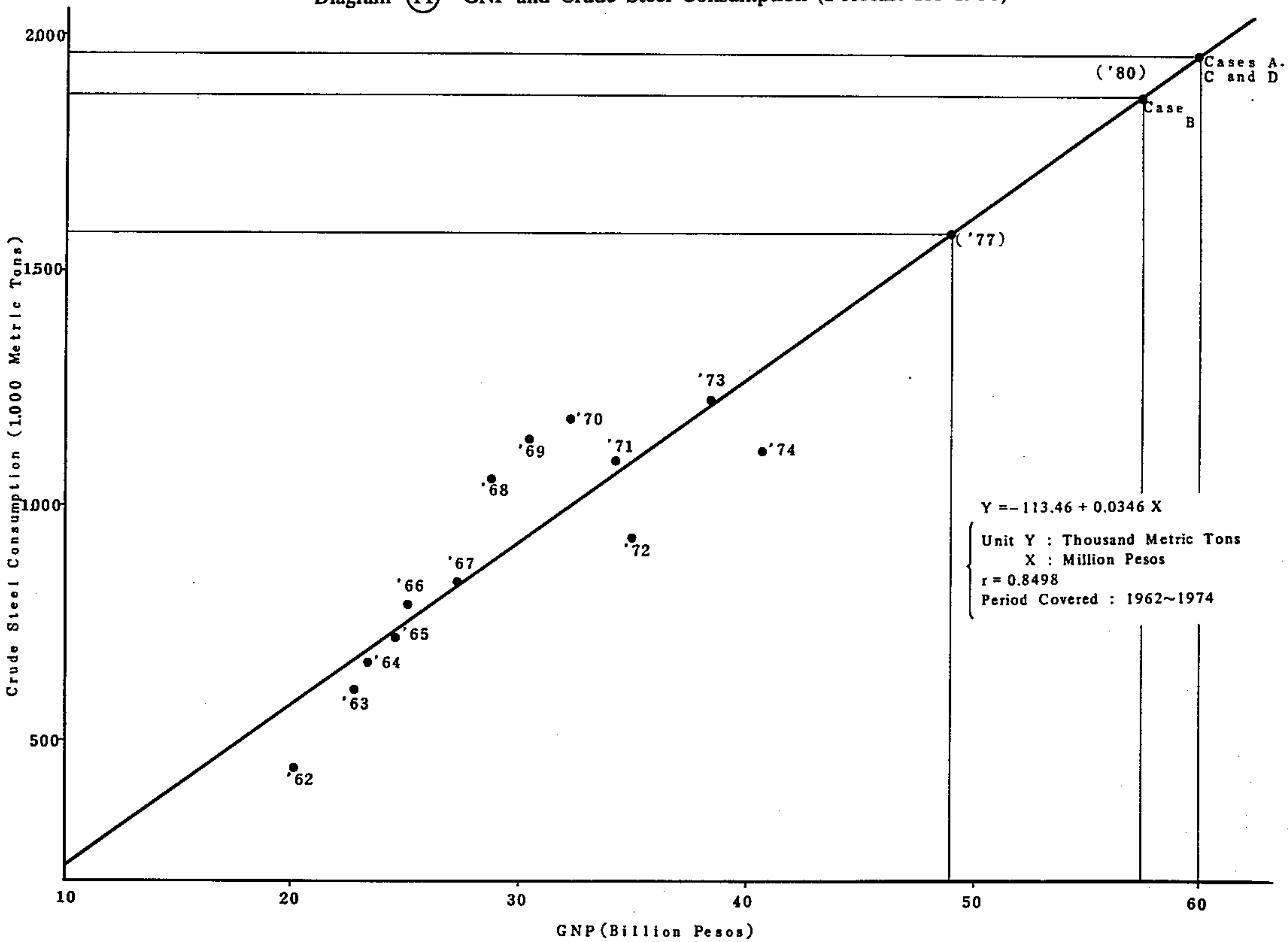
The indicators of activities by sectors employed in computing estimates by sectoral accumulation and steel demand for each Case are as given in Tables ⑲ and ⑳ .

6) Assuming the same GNP growth rate, steel demand in 1980 would vary considerably, from the high of 1,984,000 tons (2,500,000 tons on a crude steel basis) for Case A to the low of 1,615,000 tons (2,040,000 tons on a crude steel basis) for Case D, due to changes in the growth rate of private and public construction investments.

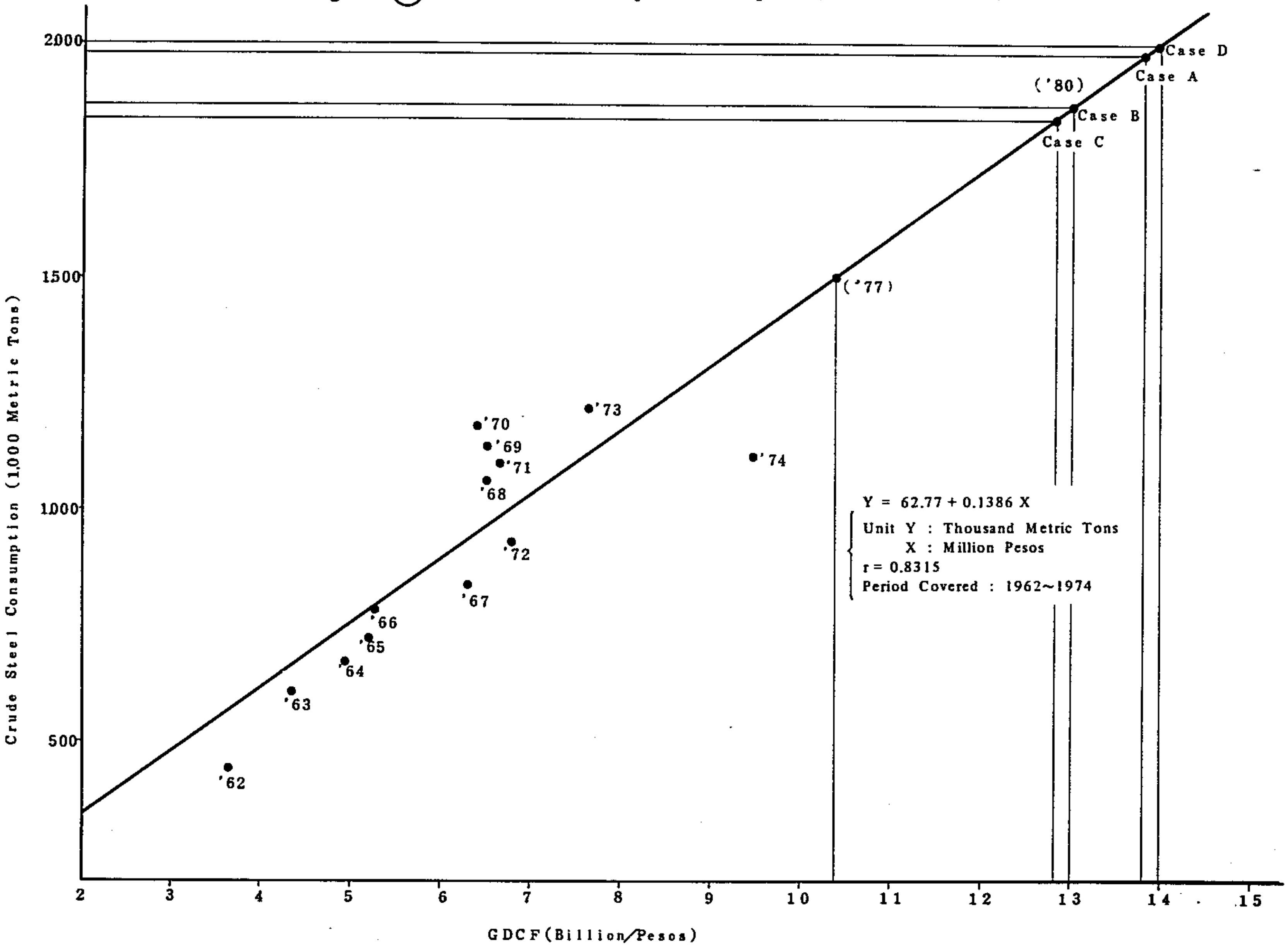
Estimates computed on the basis of accumulation by sectors and corresponding macro-approach estimates are given in Table ㉑ . For details, refer to Table ⑲ .

7) As for the growth rate and the share by type of product, Case A has it that the growth rate is high for long products and steel for construction, and is low for flat products, while Case D that it is relatively high for flat products and low for long products and steel for construction. (Table ㉒ )

## Diagram (11) GNP and Crude Steel Consumption (Forecast for 1980)



## Diagram ⑫ GDCF and Crude Speel Consumption (Forecast for 1980)



## Table ⑰ Economic Plans and Economic Forecast for 1980

Unit : 1967 Prices, Million Pesos, %

| | 1973(Actual) | | 1974(Actual) | | 1977(Planned) | | 1980(Case A) | | 1980(Case B) | | 1980(Case C) | | 1980(Case D) | | Growth Rate% (1980/1973 Annual Rate) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % | | % | | % | | % | | % | | % | | % | A | B | C | D |
| G N P | 38,415 | 100 | 40,655 | 100 | 48,861 | 100 | 59,857 | 100 | 57,382 | 100 | 59,857 | 100 | 59,857 | 100 | 6.5 | 5.9 | 6.5 | 6.5 |
| Personal Consumption Expenditures | 27,545 | 71.7 | 29,214 | 71.9 | 32,558 | 66.6 | 37,798 | 63.1 | 36,626 | 63.8 | 39,885 | 66.6 | 43,037 | 71.9 | 4.6 | 4.2 | 5.4 | 6.6 |
| Current Government Expenditures | 3,356 | 8.7 | 3,658 | 9.0 | 3,746 | 7.7 | 4,068 | 6.8 | 3,989 | 7.0 | 4,589 | 7.7 | 5,386 | 9.0 | 2.8 | 2.5 | 4.6 | 7.0 |
| G D C F | 7,676 | 20.0 | 9,469 | 23.2 | 10,417 | 21.3 | 13,794 | 23.0 | 13,007 | 22.6 | 12,761 | 21.3 | 13,912 | 23.2 | 8.7 | 7.8 | 7.5 | 8.9 |
| Private | 6,690 | 17.5 | 6,996 | 20.6 | 8,542 | 17.5 | 10,760 | 18.0 | 10,268 | 17.8 | 10,464 | 17.5 | 12,356 | 20.6 | 7.0 | 6.3 | 6.6 | 9.2 |
| Construction | 1,486 | 3.9 | 1,545 | 3.8 | 2,022 | 4.1 | 2,547 | 4.3 | 2,418 | 4.2 | 2,477 | 4.1 | 2,275 | 3.8 | 8.0 | 7.2 | 7.6 | 6.3 |
| Equipment | 4,217 | 11.0 | 5,595 | 13.8 | 5,312 | 10.9 | 6,691 | 11.2 | 6,391 | 11.1 | 6,507 | 10.9 | 8,238 | 13.8 | 6.8 | 6.1 | 6.4 | 10.0 |
| Inventory | 986 | 2.6 | 1,252 | 3.1 | 1,208 | 2.5 | 1,522 | 2.5 | 1,459 | 2.5 | 1,480 | 2.5 | 1,843 | 3.1 | 6.4 | 5.8 | 6.0 | 9.3 |
| Public Construction | 987 | 2.6 | 2,473 | 2.6 | 1,875 | 3.8 | 3,034 | 5.1 | 2,739 | 4.8 | 2,297 | 3.8 | 1,556 | 2.6 | 17.4 | 15.7 | 12.8 | 6.7 |
| Manufacturing Industry | 6,527 | 17.0 | 6,755 | 16.6 | 8,957 | 18.3 | 11,922 | 19.9 | 11,286 | 19.7 | 10,973 | 18.3 | 9,945 | 16.6 | 9.0 | 8.1 | 7.7 | 6.2 |
| Agriculture | 9,306 | 24.2 | 9,626 | 23.7 | 11,182 | 22.9 | 12,945 | 21.6 | 12,664 | 22.1 | 13,698 | 22.9 | 14,173 | 23.7 | 5.0 | 4.5 | 5.7 | 6.2 |

(Note): Case A: Growth of Components through 1980 at same rate as in 1973–1977
Case B: 10% decrease of Case A growth rate in 1973–1980
Case C: same GNP growth rate as in Case A and same distribution ratio of components as in 1977
Case D: same GNP gorwth rate as in Case A and same distribution ratio of components as in 1974

## Table ⑱ Demand Forecast by Macro-Approach

GDCF and Domestic Demand for Crude Steel

| | GDCF (Million Pesos) | | Domestic Demand (Crude Steel Equivalent) (1,000 Metric tons) | |
|---|---|---|---|---|
| | 1977 | 1980 | 1977 | 1980 |
| Case A | 10,417 | 13,794 | 1,507 | 1,975 |
| Case B | | 13,007 | | 1,865 |
| Case C | | 12,761 | | 1,831 |
| Case D | | 13,912 | | 1,991 |

GNP and Domestic Demand for Crude Steel

| | GNP (Million Pesos) | | Domestic Demand (Crude Steel Equivalent) (1,000 Metric Tons) | |
|---|---|---|---|---|
| | 1977 | 1980 | 1977 | 1980 |
| Case A | 48,861 | 59,857 | 1,577 | 1,958 |
| Case B | | 57,382 | | 1,872 |
| Case C | | 59,857 | | 1,958 |
| Case D | | 58,857 | | 1,958 |

## Table ⑲ Indicators of Activities and Domestic Demand of Steel Products for 1980

| Sector | Indicators | Activity Indicators | | | | | Domestic Steel Demand (1,000 MT) | | | | | Growth Rate(annual) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1973 | 1980 | | | | 1973 | 1980 | | | | 1980/1973 | | | |
| | | actual | A | B | C | D | actual | A | B | C | D | A | B | C | D |
| Construction Private | Private Construction in GDCF (1967 prices, million pesos) | 1486 | 2547 | 2418 | 2477 | 2275 | 36967 | 63362 | 60148 | 61620 | 56595 | 8.0 | 7.2 | 7.6 | 6.3 |
| Public | Public Construction in GDCF (1967 prices, million pesos) | 987 | 3034 | 2739 | 2297 | 1556 | 137.76 | 42347 | 38230 | 32060 | 21718 | 17.4 | 15.7 | 12.8 | 6.7 |
| Cans and Containers Food Cans | Milk Production (Kg) | 146555 | 233504 | 223975 | 250473 | 276100 | 7910 | 12603 | 12089 | 13519 | 14902 | 6.9 | 6.2 | 8.0 | 9.5 |
| Other Cans and Containers | Index of Industrial Production (1965=100) | 170.5 | 295.5 | 280.8 | 273.4 | 248.9 | 8559 | 14854 | 14115 | 13725 | 12494 | 8.2 | 7.4 | 7.0 | 5.6 |
| Automobiles | Domestic Sales | 32271 | 135700 | 105887 | 135700 | 135700 | 3355 | 14108 | 11008 | 14108 | 14108 | 20.6 | 18.5 | 20.6 | 20.6 |
| Home Appliances | Units Produced of Refrigerators and Air-Conditioners | 111105 | 225796 | 211061 | 225796 | 225796 | 4268 | 8674 | 8105 | 8674 | 8674 | 10.7 | 9.6 | 10.7 | 10.7 |
| Fabricators | Total Construction in GDCF (1967 prices, million pesos) | 2473 | 5581 | 5157 | 4774 | 3831 | 9022 | 20362 | 18815 | 17417 | 13976 | 12.3 | 11.1 | 9.9 | 6.5 |
| Agriculture | Index of Agricultural Production (1965=100) | 136.6 | 192.2 | 185.9 | 201.4 | 208.0 | 1911 | 2689 | 2601 | 2818 | 2910 | 5.0 | 4.5 | 5.7 | 6.2 |
| Other Manufacturing | Index of Industrial Production (1965=100) | 170.5 | 295.9 | 280.8 | 273.4 | 248.9 | 8288 | 14384 | 13668 | 13290 | 12098 | 8.2 | 7.4 | 7.0 | 5.6 |
| Dealers | Average Growth of Domestic Steel Demand | | | | | | 2432 | 5004 | 4626 | 4586 | 4075 | 10.8 | 9.6 | 9.5 | 7.7 |
| Total | | | | | | | 9649 | 19840 | 18341 | 18182 | 16155 | 10.8 | 9.6 | 9.5 | 7.6 |
| Crude Steel Basis | | | | | | | 1219 | 2499 | 2311 | 2292 | 2042 | 10.8 | 9.6 | 9.5 | 7.6 |
| (Reference) Macro Estimates | Correlation with GNP | | | | | | | 1958 | 1872 | 1958 | 1958 | 7.0 | 6.3 | 7.0 | 7.0 |
| | Correlation with GDCF | | | | | | | 1975 | 1865 | 1831 | 1991 | 7.1 | 6.2 | 6.0 | 7.3 |

## Table ⑳ –(1) Consumption Patterns by Products (1980)

Unit: 1,000MT

| | Calendar year | Construction | | | Cans and Containers | | | Automobiles | Home Appliances | Fabricators | Agriculture | Other Manufacturing Industries | Dealers | Total | Share(%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Private | Public | Total | Foodcans | Other | Total | | | | | | | | |
| Galvanized Sheets | 1973 | 95.06 | 27.16 | 122.22 | | | | | | | | 13.58 | | 135.8 | 14.1 |
| | 1980 (A) | 162.93 | 83.49 | 246.42 | | | | | | | | 23.57 | | 270.0 | 13.6 |
| | 〃 (B) | 154.68 | 75.37 | 230.05 | | | | | | | | 22.40 | | 252.5 | 13.8 |
| | 〃 (C) | 158.45 | 63.21 | 221.66 | | | | | | | | 21.76 | | 243.4 | 13.4 |
| | 〃 (D) | 145.54 | 42.82 | 188.36 | | | | | | | | 19.82 | | 208.2 | 12.9 |
| Tin Plates | 1973 | | | | 79.1 | 33.9 | 113.0 | | | | | | | 113.0 | 11.7 |
| | 1980 (A) | | | | 126.03 | 58.83 | 184.86 | | | | | | | 184.9 | 9.3 |
| | 〃 (B) | | | | 120.89 | 55.91 | 176.80 | | | | | | | 176.8 | 9.6 |
| | 〃 (C) | | | | 135.19 | 54.36 | 189.55 | | | | | | | 189.6 | 10.4 |
| | 〃 (D) | | | | 149.02 | 49.49 | 198.51 | | | | | | | 198.5 | 12.3 |
| Cold Rolled Sheets | 1973 | | | | | 34.88 | 34.88 | 13.08 | 30.52 | 21.8 | | 8.72 | | 109.0 | 11.3 |
| | 1980 (A) | | | | | 60.53 | 60.53 | 55.00 | 62.02 | 49.2 | | 15.13 | | 241.9 | 12.2 |
| | 〃 (B) | | | | | 57.52 | 57.52 | 42.92 | 57.98 | 45.46 | | 14.38 | | 218.3 | 11.9 |
| | 〃 (C) | | | | | 55.93 | 55.93 | 55.00 | 62.02 | 42.08 | | 13.98 | | 229.0 | 12.6 |
| | 〃 (D) | | | | | 50.92 | 50.92 | 55.00 | 62.02 | 33.77 | | 12.73 | | 214.4 | 13.3 |
| Heavy & Medium Plates | 1973 | 16.8 | | 16.8 | | 9.8 | 9.8 | 9.1 | 8.4 | 6.3 | | 13.3 | 6.3 | 70.0 | 7.3 |
| | 1980 (A) | 28.8 | | 28.8 | | 17.01 | 17.01 | 38.27 | 17.07 | 14.22 | | 23.08 | 12.95 | 151.4 | 7.6 |
| | 〃 (B) | 27.3 | | 27.3 | | 16.16 | 16.16 | 29.86 | 15.96 | 13.14 | | 21.93 | 11.97 | 136.3 | 7.4 |
| | 〃 (C) | 28.0 | | 28.0 | | 15.71 | 15.71 | 38.27 | 17.07 | 12.16 | | 21.33 | 11.89 | 144.1 | 7.9 |
| | 〃 (D) | 25.7 | | 25.7 | | 14.31 | 14.31 | 38.27 | 17.07 | 9.76 | | 19.42 | 10.55 | 135.1 | 8.4 |
| Hot Rolled Sheets | 1973 | | | | | 7.01 | 7.01 | 7.01 | 2.7 | 15.09 | | 7.0 | 15.09 | 53.9 | 5.6 |
| | 1980 (A) | | | | | 12.17 | 12.17 | 29.48 | 5.5 | 34.06 | | 12.15 | 31.03 | 124.4 | 6.3 |
| | 〃 (B) | | | | | 11.56 | 11.56 | 23.00 | 5.1 | 31.47 | | 11.54 | 28.68 | 111.4 | 6.1 |
| | 〃 (C) | | | | | 11.24 | 11.24 | 29.48 | 5.5 | 29.13 | | 11.22 | 28.44 | 115.0 | 6.3 |
| | 〃 (D) | | | | | 10.23 | 10.23 | 29.48 | 5.5 | 23.38 | | 10.22 | 25.27 | 104.1 | 6.4 |
| Pipes & Tubes | 1973 | 56.32 | 6.67 | 62.99 | | | | | | | | 11.11 | | 74.1 | 7.7 |
| | 1980 (A) | 96.53 | 20.50 | 117.03 | | | | | | | | 19.28 | | 136.3 | 6.9 |
| | 〃 (B) | 91.64 | 18.51 | 110.15 | | | | | | | | 18.32 | | 128.5 | 7.0 |
| | 〃 (C) | 93.88 | 15.52 | 109.40 | | | | | | | | 17.81 | | 127.2 | 7.0 |
| | 〃 (D) | 86.22 | 10.52 | 96.74 | | | | | | | | 16.22 | | 113.0 | 7.0 |

## Table ⑳ – (2) (Continued)

| | Calendar year | Construction | | | Cans and Containers | | | Automobiles | Home Appliances | Fabricators | Agriculture | Other Manufacturing Industries | Dealers | Total | Share (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Private | Public | Total | Foodcans | Others | Total | | | | | | | | |
| Bars | 1973 | 132.29 | 88.19 | 220.48 | | | | | | 41.34 | | 13.78 | | 275.6 | 28.6 |
| | 1980 (A) | 226.75 | 271.10 | 497.85 | | | | | | 93.03 | | 23.92 | | 615.1 | 31.0 |
| | 〃 (B) | 215.26 | 244.74 | 460.0 | | | | | | 86.21 | | 22.73 | | 568.9 | 31.0 |
| | 〃 (C) | 220.52 | 205.24 | 425.76 | | | | | | 79.80 | | 22.11 | | 527.7 | 29.1 |
| | 〃 (D) | 202.54 | 139.03 | 341.57 | | | | | | 64.04 | | 20.12 | | 425.7 | 26.3 |
| Wire Rods & Wire | 1973 | 58.44 | 15.74 | 74.18 | | | | 2.25 | | 3.37 | 19.11 | 13.49 | | 112.4 | 11.6 |
| | 1980 (A) | 100.17 | 48.38 | 148.55 | | | | 9.46 | | 7.61 | 26.89 | 23.41 | | 215.9 | 10.9 |
| | 〃 (B) | 95.09 | 43.68 | 138.77 | | | | 7.38 | | 7.03 | 26.01 | 22.25 | | 201.4 | 11.0 |
| | 〃 (C) | 97.41 | 36.63 | 134.04 | | | | 9.46 | | 6.51 | 28.18 | 21.64 | | 199.8 | 11.0 |
| | 〃 (D) | 89.48 | 24.81 | 114.29 | | | | 9.46 | | 5.22 | 29.10 | 19.69 | | 177.8 | 11.0 |
| Sections | 1973 | 10.76 | | 10.76 | | | | 2.11 | 1.06 | 2.32 | | 1.90 | 2.95 | 21.1 | 2.2 |
| | 1980 (A) | 18.44 | | 18.44 | | | | 8.87 | 2.15 | 5.23 | | 3.30 | 6.06 | 44.1 | 2.2 |
| | 〃 (B) | 17.51 | | 17.51 | | | | 6.92 | 2.01 | 4.84 | | 3.13 | 5.61 | 40.0 | 2.2 |
| | 〃 (C) | 17.94 | | 17.94 | | | | 8.87 | 2.15 | 4.48 | | 3.05 | 5.55 | 42.0 | 2.3 |
| | 〃 (D) | 16.47 | | 16.47 | | | | 8.87 | 2.15 | 3.59 | | 2.77 | 4.93 | 38.8 | 2.4 |
| Finished Products Total | 1973 | 369.67 | 137.76 | 507.43 | 79.1 | 85.59 | 164.69 | 33.55 | 42.68 | 90.22 | 19.11 | 82.88 | 24.34 | 964.9 | 100 |
| | 1980 (A) | 633.62 | 423.47 | 1,057.09 | 126.03 | 148.54 | 274.57 | 141.08 | 86.74 | 203.62 | 26.89 | 143.84 | 50.04 | 1,984.0 | 100 |
| | 〃 (B) | 601.48 | 382.30 | 983.78 | 120.89 | 141.15 | 262.04 | 110.08 | 81.05 | 188.15 | 26.01 | 136.68 | 46.26 | 1,834.1 | 100 |
| | 〃 (C) | 616.20 | 320.00 | 936.80 | 135.19 | 137.24 | 272.43 | 141.08 | 86.74 | 174.16 | 28.18 | 132.90 | 45.86 | 1,818.2 | 100 |
| | 〃 (D) | 565.95 | 217.18 | 783.13 | 149.02 | 124.95 | 273.97 | 141.08 | 86.74 | 139.76 | 29.10 | 120.99 | 40.75 | 1,615.5 | 100 |
| Share % | 1973 | 38.3 | 14.3 | 52.6 | 8.2 | 8.9 | 17.1 | 3.5 | 4.4 | 9.4 | 2.0 | 8.6 | 2.5 | 100 | |
| | 1980 (A) | 34.7 | 18.0 | 52.7 | 6.4 | 7.5 | 13.8 | 7.1 | 4.4 | 10.3 | 1.4 | 7.3 | 2.5 | 100 | |
| | 〃 (B) | 32.8 | 20.8 | 53.6 | 6.6 | 7.7 | 14.3 | 6.0 | 4.4 | 10.3 | 1.4 | 7.5 | 2.5 | 100 | |
| | 〃 (C) | 33.9 | 17.6 | 51.5 | 7.4 | 7.6 | 15.0 | 7.8 | 4.8 | 9.6 | 1.5 | 7.3 | 2.5 | 100 | |
| | 〃 (D) | 35.0 | 13.4 | 48.4 | 9.3 | 7.7 | 17.0 | 8.7 | 5.4 | 8.7 | 1.8 | 7.5 | 2.5 | 100 | |

## Table (21) Results of Cumulative Estimates by Sectors and Comparison with Results of Macro-Estimates

| Unit : 1,000MT on Crude Steel Basis | Records in 1973 | Case A | Case B | Case C | Case D |
|---|---|---|---|---|---|
| Cumulative Estimates by Sectors | 1,219 | 2,499 (10.8) | 2,311 (9.6) | 2,292 (9.5) | 2,042 (7.6) |
| GNP Growth Rates ('73/'80year) | | 6.5 | 5.9 | 6.5 | 6.5 |
| GDCF Growth Rates ('73/'80year) | | 8.7 | 7.8 | 7.5 | 8.9 |
| Macro Estimates | | | | | |
| GNP Correlation | 1,219 | 1,958 ( 7.0) | 1,872 (6.3) | 1,958 (7.0) | 1,958 (7.0) |
| GDCF Correlation | 1,219 | 1,975 ( 7.1) | 1,865 (6.2) | 1,831 (6.0) | 1,991 (7.3) |

Note: Figures in parentheses signify average growth rates for 1973–1980

## Table (22) Steel Demand in 1980

(Unit : 1,000 Metric tons,%)

| | 1973 | | 1980(A) | | 1980(B) | | 1980(C) | | 1980(D) | | Growth Rates 1980/1973 (annual rates) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % | | % | | % | | % | | % | Case A | Case B | Case C | Case D |
| Flat Products | 481.7 | 49.9 | 972.6 | 49.0 | 895.3 | 48.8 | 921.1 | 50.7 | 860.3 | 53.3 | 10.6 | 9.3 | 9.7 | 8.6 |
| Long Products | 409.1 | 42.4 | 875.1 | 44.1 | 810.3 | 44.2 | 769.5 | 42.3 | 642.3 | 39.8 | 11.5 | 10.3 | 9.4 | 6.7 |
| Pipes & Tubes | 74.1 | 7.7 | 136.3 | 6.9 | 128.5 | 7.0 | 127.2 | 7.0 | 113.0 | 7.0 | 9.1 | 8.2 | 8.0 | 6.2 |
| Total | 964.9 | 100 | 1,984.0 | 100 | 1,834.1 | 100 | 1,818.2 | 100 | 1,615.5 | 100 | 10.8 | 9.6 | 9.5 | 7.6 |
| in which Steel Products for Construction | 619.0 | 64.2 | 1,281.4 | 64.6 | 1,191.3 | 65.0 | 1,140.1 | 62.7 | 963.5 | 59.6 | 11.0 | 9.8 | 9.1 | 6.5 |

Note: 5 types of steel products for construction use (galvanized sheets, steel pipes)

## IV COMMENTS

It is suggested:

1) That the micro-approach be adopted for demand forecast in the Philippines for the time being, while the macro-approach play a secondary role to supplement demand estimates computed by the former;

2) That the present situation of, and future trends in, the specific consumption of steel in the steel consuming sectors be fully grasped in case the cummulative sectoral approach is employed; and

3) That various kinds of statistics on the steel industry as well as on consuming industries be consolidated, thereby to facilitate forecasting operations and improve the precision of estimates.

The statistics in question would, for example, be:

a) Statistics on steel production (broken down by products)

b) Statistics on consumption of steel for further processing (broken down by products)

c) Inventory statistics (broken down by products)

d) Statistics on steel shipments and deliveries by uses and regions (broken down by products)

e) Statistics on steel imports and exports (broken down by products)

## REFERENCE MATERIALS – (B)

### Transportation of products

1) The largest market for steel products in the Philippines is the island of Luzon centering on Greater Manila. Presuming insignificant changes in the future, it will be an important challenge to build an integrated steel mill on the island of Mindanao away from the seats of major steel customers, and make it a major supply source of iron and steel products, including semi-finished products, to consolidate the domestic transportation network of imports of raw materials from abroad.

2) To underline the importance of this problem, the Team dared to attempt an estimate, the purpose of which was not to present figures of high probability, but to suggest a method of estimating inter-island transport in the years ahead.

3) Inter-island transport of products is a bridge between demand and supply differences from one region to another. Accordingly, demand and supply in each region at present and for the future were estimated on the following assumptions.

a) Future demand by region

i) Future domestic demand met future demand by product estimated by the Philippine government (Table ㉓ ).

ii) In demand by region Visayas and Mindanao increased 20 per cent for each product compared with 1973 levels.

b) Future production by regions

i) Domestic production of finished products was worked out on the basis of the import ratios forecast by the Philippine government.

ii) Steel for further processing, such as billets, cold rolled coils and hot rolled coils, assumed overall domestic production.

iii) As for galvanized sheets, tin plates, steel pipes and tubes, shares of production capacity by region in 1974 were adopted as those of regional production in 1980.

iv) As for steel bars and wire rods, it was assumed that 441,000 tons and 177, 000 tons, respectively, would be produced by the existing mills in Luzon and 90,000 tons and 60,000 tons, respectively by the new mill in Mindanao.

v) As for steel for further processing, it was assumed that 200,000 tons of billets and 140,000 tons of cold rolled coils would be produced by the existing mills in Luzon and the balance in Mindanao. It was also assumed that something would be done to supplement the possible future shortages of hot rolled coils and cold rolled coils resulting from present production capacity.

c) Future imports by region

It was assumed that imported finished products would all be directed to Luzon. For estimates of the volume of inter-regional transport in 1973, refer to the footnotes in Table (24).

4) The results of estimates worked out on the basis of these assumptions are given in Table (24), (25). The estimates concern the volume of interregional marine transport Visayas, Mindanao) and do not cover the volume of transport either by land or by sea within a given region or a given island.

It will be seen from this tables:

i) That only 290,000 tons of steel was transported inter-regionally in 1973, namely 166,000 tons on an finished steel product basis shipped from Luzon and 124,000 tons of steel for further processing from Mindanao (Table (24)). On the other hand, 503,000 tons of finished steel products or a total of 1,514,000 tons including steel for further processing would be shipped, mainly from Mindanao, in 1980, with the result that the volume of transport would expand at a pace faster (5.2 times the 1973 levels) than that for demand as a whole (2.5 times compared with 1973 levels) (Table ㉕ );

ii) And that the flow of products, which hitherto emanated from Luzon toward other regions, would originate in Mindanao when the integrated steel mill is completed.

5) Estimates have been made based on various assumptions. It is hoped that these will be modified by the Philippine government so as to be more realistic and that studies will be made, in accordance with the modified estimates, on consolidating the transportation system of products in the country, such as the scale and number of vessels, form of vessel ownership, expansion of ports and harbors including loading and unloading facilities, scale of stock yards for products, who will run these, level of future freightage, etc.

## Table ㉓ Demand and Supply Estimates for 1980 based on Demand Established by Philippine Side

Unit : 1,000MT, %

| | Production (A) | Imports (B) | Further Processing (C) | Domestic Demand (D)=(A)+(B)−(C) | Import Ratio (E)=(B)/(D) | Comparison 1974 | Regional Shares of Production Capacity in 1974 (1,000 M.T. : %) Total | Luzon (%) | Visayas (%) | Mindanao (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| Cold Rolled Products | | | | | (%) | (%) | | | | |
| Galvanized Sheets | 203 | 4 | | 207 | 19 | 65 | 394.9 | 257.9 ( 66) | 96 ( 24) | 41 ( 10) |
| Tin Plates | 203 | 4 | | 207 | 19 | 293 | 110 | 110 (100) | — | — |
| Cold Rolled Sheets | 568 | 11 | 465 | 114 | 96 | 452 | 390 | 140 ( 36) | | 250 ( 64) |
| Hot Rolled Products | | | | | | | | | — | |
| Heavy & Medium Plates | 154 | 8 | — | 162 | 49 | 100 | }300 | — | — | }300 (100) |
| Hot Rolled Sheets & Coils | 746 | 10 | 658 | 98 | 102 | 100 | | — | — | |
| Pipes & Tubes | 74 | 18 | — | 92 | 196 | 375 | 129.5 | 1295 (100) | — | — |
| Long Products | | | | | | | | | | |
| Bars | 531 | 59 | | 590 | 100 | 136 | 1,027.5 | 9555 ( 93) | | 72 ( 7) |
| Wire Rods & Wire | 237 | 5 | | 242 | 21 | 555 | 187.9 | 187.9 (100) | | — |
| Sections | — | 94 | | 94 | 100 | 100 | | — | | — |
| Finished Products Total | 1593 | 213 | (1123) | 1806 | 118 | 413 | | | | |
| Slabs | 1045 | | | 1113 | | | | | | |
| Blooms | 946 | | | 1141 | | | | | | |
| (Billets) | (852) | | | | | | | | | |
| Crude Steel | 2090 | | | 2367 | | | 441.8 | | | |

(Note) 1. Production of steel for further processing was estimated according to yield table. (Table ⑤)

2. Production of steel for further processing was assumed possible at home. In case of absence of expansion or addition of hot strip mills and cold strip mills by 1980, part of requirements will have to be met by imports. However, estimates were made on the assumption that demands would be met by domestic production.

3. It was assumed that demands for tin plates and wire rods would be supplied by domestic production, through expansion of production capacity to match demand increases:

## Table ㉔ 1973 Estimates for Inter-regional Transportation by Product

| | Demand in 1973 | | | | Output and Imports in 1973 | | | | Volume of Transport in 1973 (outgoing) (suppliers to customers) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Luzon | Visayas | Mindanao | Total | Luzon | Visayas | Mindanao | Total | Luzon | Visayas | Mindanao | Total |
| Galvanized Sheets | 82 ( 60) | 27 ( 20) | 27 ( 20) | 136 (100) | 94 ( 69) | 29 ( 21) | 13 ( 10) | 136 (100) | 12 | 2 | – | 14 |
| Tin Plates | 113 (100) | – | – | 113 (100) | 113 (100) | – | – | 113 (100) | – | – | – | 0 |
| Cold Rolled Sheets | 82 ( 75) | 11 ( 10) | 16 ( 15) | 109 (100) | 109 (100) | – | – | 109 (100) | 27 | – | – | 27 |
| Heavy & Medium Plates | 53 ( 76) | 8.5 ( 12) | 8.5 ( 12) | 70 (100) | 70 (100) | – | – | 70 (100) | 17 | – | – | 17 |
| Hot Rolled Sheets | 43 ( 80) | 5.5 ( 10) | 5.5 ( 10) | 54 (100) | 54 (100) | – | – | 54 (100) | 11 | – | – | 11 |
| Pipes & Tubes | 52 ( 70) | 11 ( 15) | 11 ( 15) | 74 (100) | 74 (100) | – | – | 74 (100) | 22 | – | – | 22 |
| Bars | 221 ( 80) | 27.5 ( 10) | 27.5 ( 10) | 276 (100) | 258 ( 93.5) | – | 18 ( 6.5) | 276 (100) | 37 | – | – | 37 |
| Wire Rods | 78.5 ( 70) | 17 ( 15) | 17 ( 15) | 112 (100) | 112 (100) | – | – | 112 (100) | 34 | – | – | 34 |
| Sections | 17 ( 80) | 2 ( 9) | 2 ( 11) | 21 (100) | 21 (100) | – | – | 21 (100) | 4 | – | – | 4 |
| Finished Products Total | 741 ( 77) | 109.5 ( 11) | 114.5 ( 12) | 965 (100) | 905 ( 94) | 29 ( 3) | 31 ( 3) | 965 (100) | 164 ( 99) | 2 ( 1) | – | 166 (100) |
| Billets for Further Processing | – | – | – | – | – | – | – | – | – | – | – | – |
| Cold Rolled Coils for Further Processing | 173 ( 81) | 29 ( 13) | 13 ( 6) | 215 (100) | 77 ( 36) | 0 ( 0) | 138 ( 64) | 215 (100) | – | – | 124 | 124 |
| Hot Rolled Coils for Further Processing | 118 ( 36) | 0 ( 0) | 212 ( 64) | 330 (100) | 118 ( 12) | 0 | 291 ( 88) | 330 (100) | – | – | – | – |
| Total | 1,032 ( 68) | 138.5 ( 9) | 339.5 ( 23) | 1,510 (100) | 1,017 ( 67) | 32 ( 2) | 460 ( 31) | 1,510 (100) | 164 ( 56.5) | 2 ( 0.5) | 124 ( 43) | 290 (100) |

Note: (1) Demand by regions computed on basis of distribution ratio by regions and products; Philippine materials (all tin plates allocated to Luzon)
(2) Production based on distribution ratio of production capacity by regions and by types of products: Philippine materials
(3) Imports of finished products allocated to Luzon; those of hot roled coils to ports of industrial location.

## Table ㉕ 1980 Estimates for Inter-regional Transport by Products

(Unit : 1,000 M.T. ; Figures in parentheses represent percentage)

| Products \ Regions | Demand in 1980 | | | | Output and Imports in 1980 | | | | Volume of Transport in 1980 (outgoing) (suppliers to customers) | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Luzon | Visayas | Mindanao | Total | Luzon | Visayas | Mindanao | Total | Luzon | Visayas | Mindanao | Total | |
| Galvanized Sheets | 107 (52) | 50 (24) | 50 (24) | 207 (100) | 144 (70) | 43 (21) | 20 (9) | 207 (100) | 37 | – | – | 37 | Shares of Production 21% for Visayas and 10% for Mindanao |
| Tin Plates | 199 (96) | 4 (2) | 4 (2) | 207 (100) | 207 (100) | – | – | 207 (100) | 8 | – | – | 8 | |
| Cold Rolled Sheets | 80 (70) | 13.5 (12) | 20.5 (18) | 114 (100) | 11 (10) | – | 103 (90) | 114 (100) | – | – | 82.5 | 82.5 | |
| Heavy & Medium Plates | 114 (70) | 24 (15) | 24 (15) | 162 (100) | 8 (5) | – | 154 (95) | 162 (100) | – | – | 130 | 130 | |
| Hot Rolled Sheets | 74 (76) | 12 (12) | 12 (12) | 98 (100) | 10 (10) | – | 88 (90) | 98 (100) | – | – | 76 | 76 | |
| Pipes & Tubes | 59 (64) | 16.5 (18) | 16.5 (18) | 92 (100) | 92 (100) | – | – | 92 (100) | 33 | – | – | 33 | |
| Bars | 448 (76) | 71 (12) | 71 (12) | 590 (100) | 500 (85) | – | 90 (15) | 590 (100) | 52 | – | 19 | 71 | |
| Wire Rods | 155 (64) | 43.5 (18) | 43.5 (18) | 242 (100) | 182 (75) | – | 60 (25) | 242 (100) | 27 | – | 16.5 | 43.5 | |
| Sections | 72 (76) | 11 (12) | 11 (12) | 94 (100) | 94 (100) | – | – | 94 (100) | 22 | – | – | 22 | |
| Finished Products Total | 1,308 (72) | 245.5 (14) | 252.5 (14) | 1,806 (100) | 1,248 (69) | 43 (2) | 515 (29) | 1,806 (100) | 179 (36) | | 324 (64) | 503 (100) | |
| Billets for Further processing | 685 (80) | – | 167 (20) | 852 (100) | 200 (23) | – | 652 (77) | 852 (100) | – | – | 485 | 485 | |
| Cold Rolled Coils for Further processing | 402 (87) | 43 (9) | 20 (4) | 465 (100) | 140 (30) | – | 325 (70) | 465 (100) | – | – | 305 | 305 | Maximum Luzon Output at 140,000 M.T. |
| Hot Rolled Coils for Further processing | 221 (34) | – | 437 (66) | 658 (100) | – | – | 658 (100) | 658 (100) | – | – | 221 | 221 | |
| Total | 2,616 (69) | 288.5 (8) | 876.5 (23) | 3,781 (100) | 1,588 (42) | 43 (1) | 2,150 (57) | 3,781 (100) | 179 (12) | | 1,335 (88) | 1,514 (100) | |

Note: (1) Total volume of demand, production and imports estimated on basis of demand and supply forecasts (Table ㉓ (Philippine Sources.) All imports of finished steel allocated to Luzon.

(2) As for regional demand, 20% growth in local demand assumed for all regions except Luzon.

(3) Output of steel for further processing assumed domestic production; 200,000 tons of billets, by electric furnace steel makers in Luzon; present capacity in Luzon of 140,000 tons of cold rolled coils for further processing was assumed maximum.

(4) As for bars, 60,000 tons of wire rods and 90,000 tons of bars assumed production by newly installed Rod and Bar Mill (Mindanao), the rest by existing mills.

(5) Figures for cold rolled sheets and hot rolled coils (including plates and sheets) are larger than for present capacity. Supplemental production in Mindanao was assumed.