

THE MINERAL INDUSTRY OF

TAIWAN

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Taiwan's economy maintained stable growth in 1995. The gross domestic product growth for 1995 stood at 6.06%, almost a full percentage point below the original governmental target of 6.9%. The exercises sparked an outward rush of capital which, coupled with sluggish consumer spending, had slowed down the Taiwan's economic growth in 1995. However, its economic growth was a remarkable achievement by the standards of an industrialized country.

Taiwan authorities had a consistent policy to provide a favorable environment for private investment, stimulate investment potential, and attract investment from foreign "high-tech" companies. The Government was making an effort to review and revise outmoded laws and regulations, simplify administrative procedures, and set up special agencies to help enterprises to upgrade technological investments.

Its population grew from 21.1 million in 1994 to 21.3 million in 1995, and the per capita gross national product (GNP) increased from \$11,604¹ in 1994 to \$12,493 in 1995. The total labor force remained at 9.2 million, and the unemployment rate increased to 1.8%. The output value of the mining sector was 0.33% of GNP, which is insignificant compared with other sectors. The consumer price index rose only 3.7% in 1995 from that of 1994.

Taiwan authorities opened the financial securities sector to more foreign firms. Such market liberation would bring the local market into alignment with the policies of the General Agreement on Tariffs and Trade. The Government reportedly believed that the growing competition would improve domestic financial management and upgrade the operational technology of local securities houses.

The Government developed a set of programs to address major problems in the areas of land, environment, labor, tariff rates, and financing to improve domestic investment conditions. The Government urged the local business community to "keep their roots in Taiwan" and to stop the exodus. The plan indicated that those who make large, substantial investments would be given the opportunity to arrange for favorable financing through the issuance of corporate convertible bonds. Imports of essential raw materials and equipment would be given preferential tariffs or quota rates. Taiwan's Environment Protection Agency (EPA) would develop more flexible regulations for less-

polluting industries such as electronics.

The Ministry of Economic Affairs (MOEA) developed a plan to develop Taiwan as an Asia-Pacific Regional operations center. MOEA believed that the Asian Pacific region would have the world's highest economic growth in the next two decades. The goal was to concentrate on activities in six areas: manufacturing, sea transportation, air transportation, finance, telecommunications, and training. Taiwan had signed investment guarantee agreements with Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. Negotiation for such an agreement with other southern Asian countries was proceeding.

Taiwan's EPA was established in August 1987 under the Executive Yuan to address environmental degradation that had become one of the most serious problems in Taiwan. According to Taiwan's Six-Year Development Plan, the country would invest \$37 billion in pollution control and environmental protection systems. Environmental regulations would be strengthened to protect the society. In 1992, Taiwan's Legislative Yuan passed the Air Pollution Control Act and strengthened noise pollution regulations to enforce a higher living standard in the country.

Industry production accounted for about 34% of the country's GNP. The Industrial Development Bureau (IDB) of the MOEA was the major Government agency dealing with industry affairs. IDB initiates specific industrial policies and development strategies. However, overall economic planning, coordination, and policy evaluation were handled by the Council for Economic Planning and Development.

During the past two decades, natural gas and coal reserves had slowly depleted, and the mining industry had also declined. Total mining output was less than 1% of total industrial production. The major mining activities in Taiwan were coal, dolomite, limestone, marble, natural gas, and salt. Coal, natural gas, and salt were mined in western Taiwan. Marble and limestone quarries were operated in eastern Taiwan. Employment in the mining and quarrying industry had steadily decreased since the early 1980's to 14,000 in 1995. The production of major mineral commodities is listed in table 1.

Because of a shortage of labor, Taiwan's industry shifted from labor-intensive products to technology- and capital-intensive goods. In 1995, the imports on metals and

minerals accounted for more than 36.1% of the total imports. It reflected the demand for quality consumer goods and capital- and technology-intensive machines and equipment.

The demand for mineral products had continuously increased over the years, while local supplies kept dwindling. The bulk of domestic supply could meet only about 25% of the country's needs. Coal, oil, and natural gas were the country's most valuable mine products. Carbonate minerals, such as dolomite, limestone, and marble, composed the most important nonfuel mining sector. In addition to the aggregates, clays, feldspar, salt, and talc made up the remaining mine production. In the metals production sector, the country produces iron and steel and processes aluminum, copper, lead, nickel, tin, and zinc from imported raw materials. Major nonfuel and fuel producers are listed in table 2.

There were 12 cement companies with a total annual output capacity of 23 million metric tons (Mt). Taiwan's cement industry would face a shortage in 1997 when the mining rights on its east coast expire. Domestic cement production would be cut as much as 40% in 1997. Cement companies were looking for investment opportunities in other countries to construct greenfield plants and to expand the output capacity of their plants in the east to ensure the stable supply of cement for the country's needs. The island consumed about 28 Mt of cement annually, and the shortage was met by imports, mainly from Japan. MOEA approved Chia Hsin Cement Corp.'s plan to invest \$120 million to build a new cement plant in the Philippines. Taiwan Cement Corp. planned to invest \$230 million to set up production lines in Indonesia, Malaysia, the Philippines, and Thailand.

China Development Corp. of Taiwan signed a memorandum of understanding with Djajanti Group of Indonesia to build a \$600 million joint-venture cement plant in the east of Indonesia. The plant would have an annual output capacity of 3.4 Mt.

Since the shutdown of the island's only copper smelter-refinery in 1991, Taiwan relied on imports for refined copper, mainly from Chile, the United States, and Japan. Over 200 copper-processing plants in Taiwan consumed about 583,000 metric tons (t) of copper each year. Because of rising labor costs, difficulties in land acquisition, and stiffening environmental protection regulations, domestic secondary copper recovery companies were exploring opportunities to move their less profitable scrap plants to neighboring countries.

China Steel Corp. (CSC), the only pig iron producer in Taiwan, received a total of \$422 million in loans from Kreditanstalt fur Wiederaufbau of Germany (\$340 million) and West Merchant Bank of the United Kingdom (\$82 million) for its fourth-phase expansion project. The 8-year noncollateral loans were set at a fixed rate of 5.38% for the United Kingdom loan and less than 7% for the German loan. CSC estimated that the expansion project would require a total investment of \$2.13 billion. Hitachi Zosen Corp. of

Japan was awarded the contract to provide a sintering plant to CSC. The sintering plant would have a daily steel production capacity of 12,000 t and be equipped with a trough-type circular chilling machine with a built-in chamber to reduce air leakage, save energy and labor, and protect the environment.

CSC placed an order with MDS Mannesman Demag Sack of Germany to supply a hot wide strip mill with an annual capacity of 3 Mt. The order included a two-stand roughing train; a seven-stand, four-high finishing train; two coiling facilities; and inspection lines. The mill could produce carbon and special steel slabs down to a thickness of 1.2 millimeters and the width between 90 centimeters (cm) and 188 cm.

CSC signed a memorandum of understanding with Kuei Yu Industrial to jointly build a \$2.1-billion steel plant in Taichung. The new plant would have an annual production capacity of 3.25 Mt of crude steel. It would become the second largest steel plant after CSC in Taiwan. Construction of plant would begin in January 1996 and was expected to be completed by the end of 2000.

Yeih Loong Group decided to invest \$4.15 billion in next 5 years to build an integrated steel mill. According to the plan, the mill initially would have three blast furnaces with an annual total output capacity of 7.5 Mt of crude steel and 2.3 Mt of hot coil in Chiku, Tainan County. The three blast furnaces would be supplied by Japan's Ishikawajima-Harima Heavy Industries Ltd. The first-phase construction was expected to be completed in 1999. A new company, Lien Ting, had been established to be in charge of this project. YLG would finance \$1.37 billion of the project with the remaining funds from local and foreign bank loans. The Government was waiting for the completion of an environment assessment from the company before an approval would be granted.

Kawasaki Steel Corp. of Japan signed an agreement with Fujian Teceka Tinplate Co. in Longhai Shi, Fujian Province, China, to supply an electro-tinplate line with annual output capacity of 150,000 t. Fujian Teceka Tinplate Co. was a joint venture of Ton Yi Industrial Co. of Taiwan; China National Cereals, Oils, and Foodstuffs Import and Export Corp.; and Japan's Kawasaki Steel Corp, Kawasho Corp., and Tomen Corp. The total investment was to be about \$100 million. Feedstock for the line would be supplied from Ton Yi's rolling mill in Taiwan.

Ton Yi Industrial Co. was majority owned by President Enterprises Corp., with minor stakes held by Kawasaki Steel Corp. and Tomen Corp. President Enterprises Corp. was one of largest processed food companies in Taiwan. President Enterprises has 10 processed food plants in China. Ton Yi operated two can-making plants in Wuxi, Jiangsu Province, and Chengdu, Sichuan Province, to supply cans for President's processed food plants.

Taiwan Nickel Refining Corp. the only nickel smelter in Taiwan, had an annual output capacity 14,000 t of nickel. In

1994, Taiwan's iron and steel industry consumed about 25,000 metric tons per year of nickel. Taiwan imported more than 20,000 t of unwrought nickel in 1995 to meet the country's demand.

The consumption of zinc continued growing, while as galvanizing and other zinc end-users increased. Taiwan consumed about 200,000 t of zinc in the last 2 years—diecasting (48%), galvanizing (36%), brass (8%), chemical (5%), and others (3%). The island consumed more than 20 Mt of steel. A growing portion of steel products would be galvanized flat products. The consumption of zinc in the steel sector would increase to 44% within next 3 years to overtake diecasting as the biggest zinc end-user sector. China became the biggest zinc supplier to Taiwan, even though direct trade between Taiwan and China was not allowed. All materials shipped from China to Taiwan had to be transported via a third country.

Taiwan's coal production dropped to 234,965 t in 1995. This decline was attributed to Government policies designed to close unsafe operations, high production costs, and reduced domestic coal resources. Since 1985, MOEA implemented a policy to close mines that failed to meet safety and profitability standards. The number of operating mines in Taiwan has steadily decreased from 108 pits in 1985 to 41 pits at yearend 1994.

China Petroleum Corp. (CPC), a monopoly oil importer, refining and the domestic fuel business in Taiwan, planned to diversify its imported oil sources. Of the CPC's total oil imports, the Middle East accounted for about 70%, mostly from Saudi Arabia, while East Asia, Africa, and other countries made up the rest. CPC signed an agreement with British Petroleum of the United States to import up to 15,000 barrels per day (bbl/d) crude oil from Alaska. The agreement was pending for U.S. Government approval.

Over the years, CPC had built five naphtha cracking plants, of which three remained operational and served as the main supplier of upstream petrochemical raw materials. CPC had increased its refining capacity to 770,000 bbl/d with the addition of two new distillation units in its Kaohsiung and Taoyuan plants.

CPC and Koo's Group, which had interests in banking and cement, as well petrochemicals, agreed in principal with 35% shares each to build the CPC's seventh naphtha cracking plant, the island's eighth. The Lee Chang Yung Chemical Industry Corp. would control 10% of the shares, and the remaining 20% would be held jointly by 16 downstream petrochemical producers. Potential shareholders would make a final decision on the location of the complex after conducting detailed evaluations of four proposed sites—Yunlin Offshore Industrial Zone, Kuanyin of Taoyuan County, Chiku of Tainan County, and Talinpu of Kaohsiung County. Under the project, a naphtha cracking plant would be constructed as well as an oil refinery that would have a

daily capacity to handle 200,000 bbl of crude oil. The complex would also have facilities for producing downstream petrochemical products. According to IDB, because of the importance of the eighth naphtha cracker to Taiwan's economic development, the project would be eligible for preferential treatment such as low-interest loans. But the high cost of land in Taiwan might force the island's eighth naphtha cracker plant to be relocated in another country.

CPC decided to move its second naphtha cracker, which was shut down in 1994, to Indonesia. CPC and some local petrochemical enterprises in Indonesia formed a joint venture to construct a petrochemical plant at Surabaya, Indonesia. The plant would be owned by Indonesia (50%), CPC (30%), and other Taiwan's petrochemical companies (20%). The investment would be about \$300 million. The project was expected to receive an approval from the Indonesian Government by June 1996.

Before 1995, Indonesia was a sole source for supplying liquefied natural gas (LNG) to Taiwan. CPC, which was responsible for LNG imports, wanted to diversify its sources of supply. CPC signed an agreement with Petronas of Malaysia to supply 1.15 Mt of LNG yearly for 20 years. The LNG would come from the field in Bintulu, Sarawak. Also, with an approval from the Mainland Affairs Council, CPC had made a proposal to China National Offshore Oil Corp. for jointly exploring oil in two areas in the East China Sea.

CPC announced the discovery of an offshore natural gas deposit at about 100 kilometers west of Kaohsiung. The deposit is located 4,000 m under the sea with an estimated of 7.3 billion cubic meters of natural gas.

¹Where necessary, values have been converted from New Taiwan dollars (NT\$) to U.S. dollars at the rate of NT\$27.4=US\$1.0 in 1995.

Major Sources of Information

Mining Department, Ministry of Economic Affairs
15 Fochow Street, Taipei, Taiwan
Taiwan Provincial Bureau of Mines
2 Chenkiang Street, Taipei, Taiwan

Major Publications

Council for Economics Planning and Development, Taipei:
Industry of Free China, monthly.
Ministry of Economic Affairs, Department of Statistics,
Taipei: Industrial Production Statistics, monthly.
Ministry of Finance, Department of Statistics, Taipei:
Monthly Statistics of Exports and Imports.
Taiwan Provincial Bureau of Mines, Taipei:
Reconstruction Statistics of Taiwan Province, Part III,
The Mining and Quarrying Annual.

TABLE 1
TAIWAN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1991	1992	1993	1994	1995
METALS					
Gold, primary kilograms	--	(2/) r/	(2/) r/	5 r/	4
Iron and steel, metal:					
Pig iron thousand tons	5,561	5,292	6,116	5,941	6,056
Ferroalloys:					
Ferromanganese	40,110	37,802	13,628	7,000 e/	5,000 e/
Ferrosilicomanganese	12,801	3,991	--	--	--
Ferrosilicon	6,252	2,606	689	500 e/	400
Steel, crude thousand tons	10,957	10,705	12,038	11,590 r/	11,605
Nickel, refined e/	11,200	10,000	9,000	10,000	10,000
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	19,389	21,464	23,971	23,722	22,478
Clays:					
Fire clay	79,497	55,008	35,094	24,354	10,194
Kaolin e/	92,970 3/	100,000	100,000	100,000	100,000
Feldspar	1,339	2,216	1,716	778	--
Gypsum, precipitated	3,723	1,673	3,182	2,876 r/	2,600 e/
Lime	613,942	669,712	650,000 e/	650,000 e/	650,000 e/
Mica	8,596	11,038	9,751	5,220 r/	5,000 e/
Nitrogen, N content of ammonia	243,389	223,719	219,781	215,377	225,750
Salt, marine	195,319	25,732	176,298	185,987	220,531
Sodium compounds, n.e.s.:					
Caustic soda	119,600	131,223	140,978	171,840	183,330
Soda ash	109,320	91,497	89,283 r/	128,327 r/	128,090
Stone:					
Dolomite thousand tons	363	254	281	264	196
Limestone do.	15,352	16,885	13,085	13,297	13,270
Marble do.	11,352	14,604	17,713	17,740	16,975
Serpentine do.	414	405	433	475	447
Sulfur	125,819	118,621	153,076	154,778	167,468
Talc	18,518	6,085	5,015	4,290 r/	4,000 e/
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	60,330	65,409	62,527	80,691	90,384
Coal, bituminous thousand tons	403	335	328	285	245
Coke do.	14	--	--	--	--
Gas, natural: e/					
Gross million cubic meters	928	872	826	867	889
Marketed do.	870	840	790	820	820
Petroleum:					
Crude thousand 42-gallon barrels	694	452	445	431	440 e/
Refinery products:					
Gasoline do.	37,070	40,740	44,050	47,320	48,000 e/
Kerosene e/ do.	2,350 3/	2,000	2,000	2,000	2,000
Diesel oil do.	30,240	30,800	33,840	36,540	37,000 e/
Fuel oil do.	83,580	81,870	84,820	88,580	89,000 e/
Lubricants fuel oil e/ do.	1,000	1,000	1,000	1,000	1,000
Asphalt. e/ do.	3,000	3,000	3,000	2,500	2,500
Liquefied petroleum gas do.	14,220	14,880	15,010	15,380	15,400 e/
Other 4/ do.	8,740	8,120	7,990	4,000	4,500 e/
Total e/ do.	180,200	182,410	191,710	197,320	199,400

e/ Estimated. r/ Revised.

1/ Includes data available through July 10, 1996.

2/ Less than 1 unit.

3/ Reported.

4/ Includes naphtha, solvent oil, and base oil.

TABLE 2
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity e/	
Cement	Asia Cement Corp.	Hsinchu	1,800	
Do.	do.	Hualien	11,150	
Do.	Chia Hsin Cement Corp.	Kaoshiung	2,200	
Do.	Lucky Cement Corp.	Tungao	1,800	
Do.	Chien Tai Cement Co. Ltd.	Kaoshiung	1,758	
Do.	Hsing Tai Cement Co. Ltd.	Taipei	1,300	
Do.	Taiwan Cement Corp.	Chutung	1,400	
Do.	do.	Hualien	280	
Do.	do.	Kaoshiung	1,900	
Do.	do.	Suao	2,230	
Do.	Universal Cement Corp.	Kaoshiung	1,400	
Coal, bituminous	Numerous independent operators	Taipei Prefecture (22 pits)	400	
Marble	Taiwan Marble Co., Ltd.	Panchiao	10	
Nickel	Taiwan Nickel Refinery	Kaoshiung	12	
Petroleum:				
Crude	thousand barrels per year	Chinese Petroleum Corp.	Chuangkeng and Tungtuchiao	850
Refinery products	do.	do.	Kaoshiung	150,000
Do.	do.	do.	Taoyuan	33,000
Steel		China Steel Corp.	Kaoshiung	6,400
Do.		Tung Eng Iron Work Co. Ltd.	do.	90
Sulfur		China Petrochemical Development Corp.	Taipei	50

e/ Estimated.