

## THE MINERAL INDUSTRY OF

# TAIWAN

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During the 1990's, Taiwan has maintained rapid economic growth and macroeconomic stability. In mid-1997, with Southeast Asian currencies depreciating sharply, the Central Bank of Taiwan initially determined against the depreciation of the New Taiwan dollar with the support of its large foreign-exchange reserves. In October, after using several billion dollars of these reserves to defend the dollar, the Bank decided to abandon its strategy because the strong New Taiwan dollar put Taiwan's industrial sectors at a disadvantage when trying to compete with other Asian countries. Also, the domestic inflationary pressures from devaluation, which made imports more expensive, were barely noticeable. In the first three quarters of the year, the consumer price index rose about 1.1% and the unemployment was less than 3% (Council for Economic Planning and Development, 1998a, Table 1; Free China Journal, 1997b).

According to the Directorate General of Budget, Accounting and Statistics, Taiwan's gross domestic product grew by 6.81% in 1997 (Directorate-General of Budget, Accounting and Statistics, 1998). The growth of Taiwan's economy held up well compared with other countries in the region—Hong Kong, Japan, Indonesia, the Republic of Korea, and Thailand. Private investment had also recovered, with a growth rate of more than 15% in 1997. Government infrastructure investment further stimulated the economy. Falling official savings and growing public expenditures had caused domestic public debt to increase steadily in the past several years. The Taiwan authorities relied largely on domestic bonds and bank loans to finance major expenditures. In 1997, the Taiwan authorities adopted austerity programs to control the budget deficit. The outstanding public debt will be reduced to 20% of gross national product (GNP) in fiscal year 1998 (July 1 - June 30). During the same period, the budget deficit is expected to decrease from 4% to 2% of GNP.

Rising labor and land costs have led many manufacturers in labor-intensive industries to move their plants to China and other countries in Southeast Asia. The structure of Taiwan's economy has changed from manufacturing based to technology based. Industrial growth is concentrated in capital- and technology-intensive industries, such as petrochemicals, computers, and electronic components. In the past decade, Taiwan attracted many high-tech companies from Japan and the United States to set up plants in the island. Many U.S.-trained Chinese scientists and engineers returned to Taiwan to assist the development of high-tech projects, a reverse of the "brain-drain" that occurred in the 1970's (Journal of Commerce, 1998b). The Ministry of Economic Affairs (MOEA) intended to develop an advanced science and high-tech industry in Taiwan. MOEA planned to increase research funds in the information electronics, the biological science and technology, and the aerospace sectors that might improve productivity and investment environment for the future. High-value, technology-intensive industries will become the main engine for growth in the next decade. Manufacturing processes will be automated to meet increasing the demand for quality. Economic

development and pollution control will be given equal emphasis on the island.

In July 1997, the Taiwan authorities began implementing tariff reductions on 289 high-tech products as part of their commitment to the multilateral Information Technology Agreement. Legislation that will lower the tariff rate of 1,130 items is pending. Taiwan relaxed investment restrictions in some commodities, including petroleum refining, coking coal, and a digital office electronic switching system. Foreign investment was still prohibited in such sectors as agriculture, basic wire line telecommunications, and liquor and cigarette production. In August 1997, the Taiwan authorities raised the cap on foreign investment from 30% to 49% in independent power projects. Restrictions on employment of foreign administrative personnel in foreign-invested firms are still in place. In April 1997, the Legislative Yuan passed an amended Patent and Trademark law. As a result, Taiwan's intellectual property rights legal structure, with the exception of its Copyright law, is consistent with the World Trade Organization Agreement on Trade-Related Aspects Intellectual Property Rights (Council for Economic Planning and Development, 1998b).

On December 26, 1997, the Legislative Yuan passed a new taxation bill to integrate business and personal income taxes into a single tax. Effective January 1, 1998, income from business operations will be taxed only once, as part of personal income, at a rate of between 10% and 40% compared with 0% to 55% under the old system (Free China Journal, 1998, Council for Economic Planning and Development, 1998b). The Taiwan authorities hoped that reduced income tax rates would improve the island's investment climate, as well as generate more spending funds for domestic consumers.

The financial crisis in Southeast Asia reduced Taiwan's exports. Exports to Southeast Asia declined by more than 2% in 1997 and were expected to decline more in 1998. About 70% of Taiwan's exports to Southeast Asia were industrial materials and machinery. The remaining 30% were consumer goods. The Government hoped that the financial crisis in Southeast Asia would be short-term and that the demand for raw materials and equipment in the region will resume soon.

Because Taiwan is poor in mineral resources, the value of domestic mining sector output accounted for less than 1% of the island's GNP. Coal, oil, and natural gas are the country's most valuable mine products. Dolomite, limestone, and marble are the most important commodities in the nonfuel mining sector. In the metals sector, the country produces iron and steel and processes aluminum, copper, lead, nickel, tin, and zinc from imported raw materials. The major imported minerals were crude oil, coal, iron ore, natural gas, kaolin, salt, limestone, and feldspar. The main exported commodities were granite, sulfur, marble, and quartz sand.

Primary aluminum production ceased in 1982. In 1997, Taiwan

produced 409,413 metric tons (t) of aluminum and aluminum alloy products from its secondary aluminum producers (Department of Statistics, 1998, table C-2). Taiwan consumed about 720,000 metric tons per year (t/yr) of aluminum. The gap between supply and demand was filled with imports. Imports of unwrought aluminum alloy were principally from Australia, France, and the United States. There were more than 100 of aluminum sheet and foil processing plants in Taiwan, and most of their products were exported to Asian countries.

A gas explosion at Feng An Metal Ltd.'s secondary aluminum smelter in Kaohsiung City shut down the production of aluminum and zinc alloys complex for a short time in 1997. The smelter is equipped with eight furnaces and had a designed output capacity of 144,000 t/yr of secondary aluminum ingots (Metal Bulletin, 1997a). At the time of the accident, the smelter operated at only 84,000 t/yr because of competition from local and foreign smelters. Feng An's 72,000-t/yr secondary zinc plant, which is located next to the smelter was not affected by the explosion, but the company decided to halt all aluminum and zinc production temporarily. Feng An is a sister company of An Feng Steel Co. Ltd.; both are subsidiaries of the An Feng Group.

In 1997, there were 11 cement producers operating 15 plants—9 in the west coast and 6 in the east coast—with a total output capacity of 23 million metric tons per year (Mt/yr). The quarry mining rights in the west coast were supposed to expire at the end of 1997; and the Government urged cement producers to relocate their plants to eastern Taiwan. Several west coast cement producers have stocked up several million tons of limestone to be used cement production for next 3 years (Economic Daily News, 1998).

The Taiwan authorities intended to attract three cement producers to the Hoping Cement Zone in Hualien County. MOEA approved Taiwan Cement Corp.'s (TCC) plan to invest US\$2.93 billion to set up three cement kilns in the production zone by 2000. Each kiln will have an output capacity of 2.7 Mt/yr of cement. The TCC plan also includes the construction of a US\$1.39 billion powerplant in the zone. The powerplant will have an installed capacity of 1.32 million megawatts. Aston of the United Kingdom was awarded the contract to build the powerplant, which was scheduled to be completed in 2001. In addition, TCC will invest \$510 million to build a new port at the production zone, for which the Executive Yuan had approved the allocation of 150 hectares (Free China Journal, 1997; International Cement Review, 1997; Bulk Journal International, 1997). The nine-dock facility was expected to handle 19 Mt/yr of cement and was scheduled to be completed in 2001. MOEA also approved the Southeastern Cement Corp. plan to build two cement kilns, each with an output capacity of 1.5 Mt/yr, in the Hoping Cement Zone.

In early 1997, Taiwan's steel sectors began to recover from the depression in the past several years. After the completion of China Steel Corp.'s (CSC) fourth blast furnace in late 1996, steel production capacity increased to 8.05 Mt/yr. Taiwan had steel output capacity of 16.94 Mt/yr—8.05 Mt/yr from CSC blast furnaces and 8.89 Mt/yr from electric arc furnaces (Economic Daily News, 1998).

MOEA decided to sell 182.19 million shares of CSC as part of the privatization of state-owned enterprises in 1997 (Free China Journal, 1997c). Each applicant was allowed to purchase as many as 3,000 shares. The decision to limit the purchase was to prevent the privatized state-owned enterprises from being controlled by conglomerates. The Taiwan authorities believed that privatization

would increase CSC's competitiveness in the global market.

Australia's Foreign Investment Review Board approved the merge of An Feng Steel Co. Ltd. of Taiwan and Kingstream Resources NL of Australia into a new entity, An Feng Kingstream. The new company planned to invest A\$1.4 billion to develop an iron ore mine and a direct reduction iron (DRI) plant at Oakajee, Perth, Australia. The 2.4-Mt/yr output of steel slab will be used at the An Feng Kingstream rolling mill in Kaohsiung, Taiwan. The project will be funded with 30% equity and 70% commercial loans. The company also applied for tax concessions worth about A\$43 million from the Australian Government. The construction of the DRI plant will begin in July 1998 and is scheduled to be completed in 2 years (Metal Bulletin, 1998b).

Sheng Yu Steel Co. of Taiwan, a subsidiary of Yodogawa Steel Works of Japan, CSC, and Vietnam Steel Corp. planned to jointly invest US\$90 million to build a 250,000-t/yr cold-rolled steel plant in Vietnam. CSC and Vietnam Steel will each take up to 30% of the equity. The project was pending upon the approval of the Vietnamese Government (Journal of Commerce, 1997).

The Yieh Loong Group was still waiting for the final approval from the Government to construct its US\$4 billion integrated steel plant in Chiku, Tainan County. The company is expecting that the Government will finally approve its plan in spring 1998 and will begin construction in late 1998. Construction and commissioning of the three blast furnaces will be completed within 7 years. The company planned to add a fourth blast furnace later to raise the total crude steel output capacity to 12 Mt/yr (Metal Bulletin, 1997b).

Chang Mien Industries in Kaohsiung City, awarded Mannesmann Demag of Germany and an Italian company a contract to supply a 70,000-t/yr cold rolling mill. The cold rolling mill will be capable of producing austenitic and ferritic stainless steel strip of from 600 to 1,300 millimeters (mm) width and 0.1 mm thick. The mill is scheduled to start operation in May 1999. After completion, Chang Mien will have a total rolling capacity of 120,000 t/yr (Metal Bulletin, 1998c).

The Ministry of Finance of Taiwan ordered four foreign steel companies—BHP of Australia, Nizhny-Tagil of Russia, Huta Katowice of Poland, and a Republic of Korea of foundry to pay addition tariffs on the structural steel products that they exported to Taiwan. The dumping charges had been brought by Tung Ho Steel of Taiwan. These four companies do not appeal the Ministry decision, otherwise they will face further action if they fail to raise prices of their products (Steel Times International, 1997; Metal Bulletin, 1998a).

The energy sector supplied only about 4% of the island's total energy needs in the 1990s; this is a sharp decline compared with about 20% in 1970's. Taiwan is becoming more reliant on imported energy to meet its domestic demand. In the past several years, coal production dropped sharply. In 1997, Taiwan produced less than 100,000 t of coal and imported more than 36 million metric tons (Mt) of different kinds of coal from Australia, Indonesia, China, South Africa, and the United States. Imports from Australia, Indonesia, and China increased by a double-digit rates in 1997 from those of 1996, but those from South Africa and the United States declined. Taiwan Power Co. is the island's major coal consumer (Economic Daily News, 1998).

Taiwan's oil exploration and refining is mainly dependant on the state-owned Chinese Petroleum Corp. (CPC). With limited oil resources, Taiwan relies heavily on imports. In 1997, Taiwan

produced 50,670 kiloliters (318,710 U.S. barrels) of crude oil and imported more than 32 Mt of crude oil from 10 countries in the Middle East and Africa. CPC supplies petrochemical raw materials to petrochemical producers in Taiwan. From its three operating naphtha cracking units, CPC has output capacity of 1,02 Mt/yr of ethylene, 625,000 t/yr of propylene, and 173,000 t/yr of butadiene. The expanded liquefied natural gas (LNG) receiving terminal at Yungan, Kaohsiung, was put into full operation in late 1996. The terminal has a receiving capacity of 4.5 Mt/yr of LNG. In 1997, CPC imported 3.23 Mt LNG, of which 1.58 Mt was from Indonesia, and the remainder, from Malaysia (Chinese Petroleum Corp., [1998]).

According to the provisions of Taiwan's Fair Trade Act, enacted in 1991, CPC would have a 5-year grace period to phase out such preferential or monopolistic practices as described above. The Formosa Plastics Group's (FPG) naphtha cracking complex was scheduled to start operating in 1998, and LNG and aviation fuel would be opened to free import beginning in January 1999. The CPC privatization plan was to be carried out in three phases. CPC planned to sell 15% of the company shares in 1998 in the domestic market and to sell 12% to 18% to foreign investors. By 2001, CPC will have sold at least 50% of its shares. Corruption scandals and plant explosion accidents forced the Government to delay privatization of CPC. The Government planned to strengthen the CPC management structure and plant safety before the CPC shares to be listed in domestic stock market in 1999 (Asian Chemical News, 1998a; Financial Times, 1998; Free China Journal, 1997c, Journal of Commerce, 1998a). Because of the CPC's corruption scandals, MOEA submitted the Petroleum Management Law to the Legislative Yuan for approval in 1998.

CPC abolished its 1994 plan to build a US\$360 million naphtha cracking plant in Indonesia. The company stated that other investors had pulled out of the project and that the opportunity for investment had passed (Far Eastern Economic Review, 1997). CPC announced that the company signed a memorandum of cooperation with the Philippine Petroleum Development Corp., an affiliate of the state-owned Philippine National Oil Corp., for joint the construction of a naphtha cracking plant in the Bataan Petroleum Park in the Philippines. The plant was designed to produce 600,000 t/yr of ethylene and 300,000 t/yr of propylene (Chinese Petroleum Corp. [1998]).

On July 11, 1996, the Mainland Affairs Council approved an agreement between Offshore Petroleum Investment Corp. (OPIC), a subsidiary of CPC, and China National Offshore Oil Co. (CNOOC) for joint the exploration for oil and LNG in a 15,400-square-kilometer (km<sup>2</sup>) area in the Pearl River Delta. OPIC will search 7,600 km<sup>2</sup>, and CNOOC will explore the remaining 7,800 km<sup>2</sup>, with 118 degrees east longitude as the line of division.

The Taiwan's provincial assembly approved land lease to allow Bayer AG of Germany to build a US\$1.8 billion toluene diisocyanate (TDI) plant on reclaimed land at Wuchi, near Taichung Harbor. The TDI plant, however, faced strong opposition from local residents and environmental groups. Bayer must obtain construction and other permits from the Taichung County Government. An official from Bayer's headquarters in Germany announced that the company had lost confidence in the legal permitting system in Taiwan after more than 3 years of effort. The company decided to move the TDI project to Baytown, Texas (Asian Chemical News, 1997; Chemical and Engineering News, 1998; Chemical Week, 1998, Free China Journal, 1997d).

The petrochemical sector generates about one-third of the production and trade volume for Taiwan's manufacturing industry. In the past two years, the Taiwan's petrochemical producers faced more challenging than before. Lower prices on ABS (a combination of acrylonitrile, butadiene, and styrene) and polystyrene, which are raw materials in the manufacturing of plastics are cutting the profit margins of many petrochemical producers in Taiwan. Chi Mei Corp., one of leading ABS producers in the world, faced the challenge of reducing operating costs and its market shares from competitors from the Republic of Korea and Southeast Asia. To regain its market shares especially in China, with an approval from the Investment Commission of MOEA, Chi Mei will build an ABS plant, next to its 150,000-t/yr polystyrene plant which is under construction, in Zhenjiang, Jiangsu Province, China (Asian Chemical News, 1998b). More and more Taiwan's petrochemical producers adopt strategies for the vertical integration of operation to solidify their market footholds and to diversify product lines. FPG is building a naphtha cracking plant to ensure the supply of raw materials for its polystyrene plants in Taiwan.

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TABLE 1  
TAIWAN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997
<b>METALS</b>					
Gold, primary kilograms	1 r/	5	11	11 r/	9
Iron and steel, metal:					
Pig iron thousand tons	6,116	5,941	6,056	6,050	8,870
Ferroalloys:					
Ferromanganese e/	13,628 2/	7,000	5,000	5,000	5,000
Ferrosilicon e/	689 2/	500	400	500	500
Steel, crude thousand tons	12,038	11,590	11,605	12,655	15,478
Nickel, refined e/	9,000	10,000	10,000	10,000	10,500
<b>INDUSTRIAL MINERALS</b>					
Cement, hydraulic thousand tons	23,971	23,722	22,478	21,537	21,522
Clays:					
Fire clay	35,094	24,354	10,194	9,230	5,045
Kaolin e/	100,000	100,000	100,000	95,000	80,000
Feldspar	2,102 r/	854 r/	--	20	--
Gypsum, precipitated	3,182	2,876	3,136	2,603 r/	2,317
Lime e/	650,000	650,000	650,000	650,000	650,000
Mica	9,751	5,220	9,792	8,510 r/	7,806
Nitrogen, N content of ammonia	219,781	215,377	225,750	251,850	249,715
Salt, marine	176,298	185,987	220,531	233,321	62,484
Sodium compounds, n.e.s.:					
Caustic soda	140,978	171,840	183,330	196,980	204,470
Soda ash	89,283	128,327	128,090	128,000 e/	127,000 e/
Stone:					
Dolomite thousand tons	281	264	196	116	198
Limestone do.	13,085	13,297	13,270	11,332	15,447
Marble do.	17,713	17,740	16,975	17,528	18,071
Serpentine do.	433	475	447	526	436
Sulfur	153,076	154,778	167,468	181,600	163,964
Talc	5,015	4,290	3,500	1,500 r/	1,331
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Carbon black	62,527	80,691	90,384	100,234	103,450
Coal, bituminous	328,124 r/	285,099 r/	234,965 r/	147,497 r/	98,203
Gas, natural:					
Gross million cubic meters	826	867	889	874	849
Marketed e/ do.	790	820	820	810	780
Petroleum:					
Crude thousand 42-gallon barrels	445	431	369	358 r/	319
Refinery products:					
Gasoline do.	44,050	47,320	50,150	52,780	51,520
Kerosene e/ do.	2,000	2,000	2,000	2,000	3,500
Diesel oil do.	33,840	36,540	37,150	36,140	43,010
Fuel oil do.	84,820	88,580	99,630	95,900	92,950
Lubricants fuel oil e/ do.	1,000	1,000	1,000	1,000	1,000
Asphalt. e/ do.	3,000	2,500	2,500	2,500	4,550
Liquefied petroleum gas do.	15,010	15,380	15,490	15,520	16,380
Other 3/ do.	7,990	17,300	19,240	20,810	20,000
Total e/ do.	191,710	210,620	227,160	226,650	232,910

e/ Estimated. r/ Revised.

1/ Includes data available through July 30, 1998.

2/ Reported figures.

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

TABLE 2  
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(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.	Chuhuangkeng and Tungtzechiao	850
Refinery products	thousand barrels per day	do.	Kaoshiung	570
Do.	do.	do.	Taoyuan	200
Steel		China Steel Corp.	Kaoshiung	8,100
Do.		Feng Hsin Iron and Steel Co. Ltd.	Taichung Hsien	1,000
Do.		Tang Eng Iron Work Co. Ltd.	Kaoshiung	156
Do.		Yieh Unit Steel Corp.	do.	800
Sulfur		China Petrochemical Development Corp.	Taipei	50

e/ Estimated.