



2007 Minerals Yearbook

TAIWAN

THE MINERAL INDUSTRY OF TAIWAN

By Pui-Kwan Tse

Taiwan's economy was export oriented, and its growth prospects depended on the world economy. Despite the rising volatility in global financial markets, the high but fluid international commodity prices, and an increasingly uncertain outlook for the world economy, the island's gross domestic product (GDP) grew by 5.7% in 2007. In 2007, exports of goods increased by 10.1% compared with those of 2006. A 2.8% lower rate of growth was recorded than in 2006. The value of merchandise exports to the United States decreased, but this was offset by strong demand from China and other markets in Asia. The growth was led by the chemical, electronics, and machinery industries. Imports also grew at a moderated rate of 8.2%, which was a decrease from the 11.0% rate of growth in 2006. Coal, oil, and raw materials were the major imported commodities (Directorate General of Budget, Accounting, and Statistics, 2008, p. 3, 39-41).

Owing to a shortage of sand and gravel, the construction sector relied on imports to meet its needs. In 2006, China banned sand and gravel exports, except to Hong Kong and Macau. Sand and gravel consumers in Taiwan relied on imports from the Philippines and Vietnam to meet their needs; however, because transportation costs from these countries were high, the Taiwan authorities agreed to subsidize transportation costs during 2007 (United Daily News, 2007).

The Executive Yuan approved the Ministry of Finance's proposal to extend the tax exemption for domestic enterprises to 10 years from 5 years to offset their previous losses. The new regulation was favorable to industries featuring longer-period research and development and slow investment return. The extension of time for offsetting corporate losses was expected to benefit the biotechnology enterprises, which were being supported by the Taiwan authorities (Taiwan Economic News, 2007).

Minerals in the National Economy

Major minerals identified on the island included clay, coal, copper, dolomite, feldspar, gold, gypsum, natural gas, petroleum, serpentine, and talc. After several decades of mining, nearly all the recoverable metallic minerals, coal, and talc had been depleted. The mining industry output, which had a very small effect on the island's economy, was less than 1% of total industrial production (Directorate General of Budget, Accounting, and Statistics, 2008, p. 22).

Production

The major mining activities in Taiwan were the production of dolomite, limestone, marble, natural gas, and petroleum. Natural gas and petroleum were produced on the western part of the island, and marble and limestone were mined on the eastern part of the island. Employment in mining and quarrying had steadily decreased since the early 1990s to about 6,000 in

2007. The production value of the major mineral commodities was \$305.0 million, of which \$158.3 million was from fuels. Because Taiwan had no domestic primary aluminum, copper, lead, or zinc smelting capacity, downstream metal producers relied on imports of ingots and scrap to produce these metal products. Owing to high labor costs, environmental problems, and weak domestic demand, the output of these products had gradually decreased during the past several years, and companies had moved their manufacturing facilities to mainland China and Southeast Asian countries (Bureau of Mines, 2008; Directorate General of Budget, Accounting, and Statistics, 2008, p. 13).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Aluminum.—Owing to high production costs, primary aluminum production ceased in 1982. Since then, aluminum alloy producers imported aluminum ingot and scrap as raw materials for their alloy products. Taiwan produced about 200,000 metric tons per year (t/yr) of aluminum products and consumed about 750,000 t/yr. The gap between supply and demand was filled with imports. Imports of unwrought aluminum ingot and alloy were principally from Australia, China, and the United States. Norsk Hydro ASA of Norway acquired a 45% share in the Famco aluminum remelt plant from E-Tech Co. to produce extrusion ingot. The plant was located in the Yunlin Industrial Estate in Yunlin County and had a production capacity of 75,000 t/yr (Norsk Hydro ASA, 2008).

Iron and Steel.—Taiwan was the 12th ranked crude steel producer in the world and the 5th ranked in Asia behind China, Japan, India, and the Republic of Korea. Owing to the increased prices of coking coal, iron and steel scrap, and iron ore, prices of steel products doubled during the past 12 months. The construction sector urged the Taiwan authorities either to control steel products price increases or to provide a subsidy to the sector. Otherwise, construction companies could face serious financial losses. The Industrial Development Bureau was considering imposing a ban on the export of rebars and rods (United Daily News, 2008a).

China Steel Corp. (CSC) was the leading steel producer and the only pig iron producer in Taiwan. CSC planned to invest \$6.1 billion to expand production capacity. The investment would increase the total combined output capacity of CSC and its affiliate, Dragon Steel Corp. (in which CSC held a 70% share), to 20 million metric tons per year (Mt/yr) of steel during the next 6 years. The investment plan included two blast furnaces, each of which would be able to produce 2.5 Mt/yr

of pig iron. The first blast furnace was scheduled to begin production in December 2009 in Taichung County. The Taiwan Environmental Protection Agency (EPA) conditionally approved Dragon Steel's second blast furnace expansion plan, which would require the company to pay a \$37 million carbon tax. The second blast furnace was expected to be installed in 2012 (United Daily News, 2008b).

Taiwan's leading petrochemical producer, Formosa Plastics Group (FPG), had planned to build a 7.5-Mt/yr steel plant at Yunlin Offshore Industrial Zone in Yunlin County in 2004. A feasibility study for the construction of an integrated iron and steel plant was submitted to the Taiwan authorities for approval. In 2006, the EPA ruled that the environmental-impact report submitted by FPG was inadequate because the report did not specify the source of water to be used nor the amount of carbon dioxide and organic compound emissions; therefore, FPG would be required to conduct more studies on these issues. Facing difficulties on the island, FPG decided to turn its attention to the construction of steel plants in China and Vietnam.

FPG also signed an agreement with the Fujian Provincial government to establish Fujian Fuxin Special Steel Co. Ltd., which would build a 750,000-t/yr stainless steel plant in Zhangzhou, Fujian Province, China. FPG and the Fujian Provincial government would each hold a 50% share of the company. FPG held a groundbreaking for the Son Duong Iron and Steel and Port Complex at Vung Ang, Ha Tinh Province, Vietnam. The steel plant was designed to produce 7.5 Mt/yr of steel and the deepwater port would have a 30-Mt cargo handling capacity. Initially, the plant would rely on imported iron ore for its operations. Later, iron ore would be sourced from Thach Khe Mine in Ha Tinh Province. The steel mill would be upgraded to 15 Mt/yr at a later date. The total investment was estimated to be \$7.26 billion, and the plant was scheduled to be completed in 2011. FPG held a 95% share and Taiwan's Sun Steel Co. held the remaining 5% share. Besides FPG, CSC and E-United Group were also interested in building iron and steel plants in Vietnam (Hsiao, 2008).

Silver.—Metal Industries Research and Development Center in Kaohsiung developed a new vacuum coating technology to coat nanosilver particles on the surface of cookware, home appliances, and tableware. The nanosilver coating would prevent bacteria, such as *escherichia coli* and *staphylococcus aureus*, from coming into contact with utensils (China Post, The, 2007).

Industrial Minerals

Cement.—Owing to the restriction on sand and gravel exports from China and the decline of domestic consumption, the production of cement in Taiwan decreased slightly in 2007. Domestic demand for cement gradually decreased to about 15 Mt in 2007 from 27.9 Mt in 1993. Owing to a lack of limestone resources and a limited market on the island, Taiwan cement producers gradually moved their production base to China in the late 1990s and expanded their cement output capacities there. Taiwan's leading cement producer [Taiwan Cement Corp. (TCC)] was positioned to take advantage of the market in southern China and to be a high-end cement producer. TCC's investment strategy in China was to make

direct investments and to form joint ventures with local cement producers. TCC had invested more than \$300 million to expand capacities at its existing cement plants and to build a new plant. The company's total cement output capacity in mainland China would reach 21 Mt/yr in 2008, which would be nearly the same as the total output capacity in Taiwan. TCC planned to invest \$1 billion to expand its cement output capacity to 50 Mt/yr in China. The company planned to build new plants in each of the Provinces of Guangdong, Guangxi, and Fujian, and each plant would have two kilns. Another Taiwanese cement producer, Asia Cement Corp., also planned to expand its cement production capacity in China by 2 Mt to 11 Mt/yr in 2010. Taiwan's other cement producers also planned to build cement plants in Vietnam (China Post, The, 2008).

Mineral Fuels

Natural Gas and Petroleum.—With limited mineral fuel resources, Taiwan produced only about 1.9% of its natural gas and petroleum requirements and relied on imports—mainly through long-term contracts with Indonesia and Malaysia—to fill the gap. Liquefied natural gas (LNG) imports increased by about 8% per year during the past decade. State-owned Chinese Petroleum Corp. (CPC) was the sole LNG importing company. CPC's Taichung LNG receiving terminal was completed in 2007. CPC also discussed with Woodside Co. of Australia to supply between 2 million and 3 million liters of LNG for 20 years. Taiwan Power suspended the construction of the No. 4 nuclear powerplant; the startup was expected to be delayed until 2009. Taiwan's LNG consumption in power generation, therefore, was expected to continue to increase; domestic energy analysts projected that LNG imports would increase by an average of 7.9% during the next 15 years. CPC extended its joint-venture exploration agreement with China National Offshore Oil Corp. (CNOOC) by 2 years from the end of 2008. Cooperation between CPC and CNOOC had been put on hold since 2006 because of tension in the Taiwan Strait. CPC planned to invest \$10 million to drill the second of three exploration wells in the Tainan Basin, which is located in the Taiwan Strait. No oil was discovered in the first well. The partners also planned to explore in the Nanjih Islands Basin (also known as the Nanri Dao Basin) (United Daily News, 2008c).

Outlook

Taiwan's economic growth is heavily dependent on external trade. The expected slowdown in the economy of the United States and other developed countries in the West is expected to decrease demand for its exports. Economic growth in Taiwan is expected to slow down slightly from previous years during the next 2 years. The service sector accounts for more than 70% of the GDP and, given the island's limited mineral resources, the mining sector is expected to have only a minimal effect on the island's economy in the future. The growth of manufacturing is likely to be led by the computer, electronics components, and telecommunication products sectors. The island relies on imports of raw materials to support its iron and steel and nonferrous metals sectors. The rising prices of these raw

materials could affect producers' profit margins, and tightened environmental regulations may force nonferrous metal and steel producers to relocate their production facilities to mineral-rich countries with lower labor costs. The island has been gradually transforming from a labor-intensive manufacturing sector to a knowledge-intensive service sector. The Taiwan authorities continue their effort to promote the island as a green island and to ease economic ties with China, primarily in the areas of investment, tourism, trade, and transportation. Such changes would likely stimulate growth in the service sector.

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TABLE 1
 TAIWAN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		2003	2004	2005	2006	2007
METALS						
Iron and steel:						
Pig iron	thousand metric tons	10,779	10,938	9,854	10,500	10,550
Steel, crude	do.	18,832	19,604	18,567	19,203	20,883
Nickel, refined ^c		11,000	11,000	11,000	11,000	11,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	18,474	19,050	19,891	19,294	18,957
Feldspar		510	900	--	--	--
Fire clay		7,546	3,686	330	125	1,134
Lime		519,782	493,733	443,879	440,000 ^e	450,000 ^e
Mica		3,237	2,973	8,608	4,841	3,387
Nitrogen, liquid		534,721	650,359	794,933	800,000 ^e	800,000 ^e
Salt, marine		191	--	--	--	--
Sodium compounds:^c						
Caustic soda		568,180 ²	570,000	570,000	570,000	570,000
Soda ash		140,000	140,000	140,000	140,000	140,000
Stone:						
Dolomite	thousand metric tons	54	115	174	61	94
Limestone	do.	1,434	213	252	351	210
Marble	do.	21,041	22,970	24,070	25,493	26,452
Serpentine	do.	194	229	408	304	280
Sulfur		225,006	222,670	267,790	245,789	249,156
Talc		466	410	--	--	--
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	831	796	548	463	417
Marketed ^c	do.	760	720	490	410	380
Petroleum:						
Crude	thousand 42-gallon barrels	288	280	203	148	112
Refinery products	do.	436,531	490,977	507,462	540,000 ^e	550,000 ^e

^eEstimated; estimated data are rounded to no more than three significant digits. do. Ditto. -- Zero.

¹Includes data available through July 20, 2008.

²Reported figure.

TABLE 2
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies		Location of main facilities	Annual capacity ^c
Cement	Asia Cement Corp.		Hsinchu	1,800
Do.	do.		Hualien	4,020
Do.	Chia Hsin Cement Corp.		Kaohsiung	1,860
Do.	Chien Tai Cement Co. Ltd.		do.	1,720
Do.	Lucky Cement Corp.		Tungao	2,000
Do.	Southeast Cement Corp.		Kaohsiung	1,090
Do.	do.		Chutung	1,400
Do.	Taiwan Cement Corp.		Hualien City	1,600
Do.	do.		Hualien County	5,600
Do.	do.		Suao	3,400
Do.	Universal Cement Corp.		Kaohsiung	1,550
Marble	Taiwan Marble Co., Ltd.		Panchiao	15
Nickel	Taiwan Nickel Refinery		Kaohsiung	14
Petroleum:				
Crude	thousand 42-gallon barrels per year	Chinese Petroleum Corp.	Chuhuangkeng and Tungtzuchiao	850
Refinery products	do.	do.	Kaohsiung	570
Do.	do.	do.	Taoyuan	200
Do.	do.	Formosa Plastics Group	Yunlin	450
Steel	An Feng Steel Co. Ltd.		Kaohsiung Hsien	2,000
Do.	China Steel Corp.		Kaohsiung	13,000
Do.	Tang Eng Stainless Steel Plant		do.	300
Do.	Yieh Hsing Enterprise Co. Ltd.		Kaohsiung Hsien	450
Do.	Yieh Phui Enterprise Co. Ltd.		do.	1,300
Do.	Yieh United Steel Co.		do.	1,000
Do.	Feng Hsin Iron and Steel Co. Ltd.		Taichung Hsien	1,200
Sulfur	China Petrochemical Development Corp.		Taipei	280

^cEstimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.