



# 2006 Minerals Yearbook

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TAIWAN

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# THE MINERAL INDUSTRY OF TAIWAN

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Taiwan's economy was export oriented and the growth prospects of its economy depended on the world economy. In 2006, exports of goods increased by 12.9% compared with that of previous year and were led by electronics, machinery, and optical equipment. Imports also increased by 9.9%; this increase was driven by purchases of raw materials for producing metal products for export, and by imports of coal, petroleum, and petroleum products (Ministry of Finance, 2006a, b).

The Executive Yuan approved an energy tax on coal, natural gas, and petroleum products. The coal energy tax is NT\$0.04 per kilogram for the first year, and it is scheduled to increase by NT\$0.04 per year for the next 9 years. The tax on natural gas is NT\$0.07 per cubic meter and it is scheduled to increase by NT\$0.07 per year for 9 additional years. The tax on liquefied petroleum gas (LPG) is NT\$0.69 per liter for the first 7 years; the tax then increases by NT\$0.07 per year for years 8 through 10. The coal used in steel production and LPG for petrochemical production is exempted from the energy tax. To offset the energy tax, the commodity tax for beverages, electrical appliances, flat glass, and tires is reduced to zero. A 2-year grace period is given to companies to achieve energy conservation by retooling their equipment or renovating their manufacturing technologies (Taiwan Economic News, 2006b).

The Ministry of Finance (MOF) proposed tax reform as a means of discontinuing most investment incentives for the installation of automated and antipollution equipment. The proposal would lower the individual income tax rate to between 5% and 35% in 2010 from between 6% and 40% in 2006 and would reduce the corporate income tax rate to 15% from 25% in a 10-year period. The MOF also proposed to eliminate the tax-free royalty income privilege for foreigners and the tax-free interest income privilege for foreign financial institutions (Taiwan Economic News, 2007).

The Executive Yuan approved the "Greenhouse Gas Reduction Act," which would impose quota restrictions on Taiwanese companies. The emission controls would be imposed once mechanisms for checking greenhouse-gas emissions and systems for the registration and verification of carbon dioxide emissions are in place. Implementation would be carried out gradually. Taiwan's Environmental Protection Administration (EPA) would set up an overall carbon dioxide emissions quota system for Taiwan. Individual quotas would be set for each industry by the regulatory agency. The Taiwan authorities would set up an emissions trading center that would allow companies to sell credits for their unused emissions quota to other companies. The Act would affect such sectors as cement, iron and steel, and petrochemicals (Taiwan Economic News, 2006c).

## 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

exploitation, nearly all recoverable metallic minerals and coal had been depleted. The mining industry output, which had a minimum impact on the island's economy, was less than 1% of total industrial production (Directorate General of Budget, Accounting, and Statistics, 2007, 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 in the western part of the island and marble and limestone were mined in the eastern part of the island. Employment in mining and quarrying had steadily decreased since the early 1990s to about 6,000 in 2006. The production value of the major mineral commodities was \$258.1 million, of which \$163.9 million was from fuels. Because Taiwan had no domestic primary aluminum, copper, lead, or zinc smelting capacity, metals' fabrication manufacturers 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 declined during the past several years, and companies had moved their manufacturing facilities to mainland China and Southeast Asian countries (Bureau of Mines, 2007; Directorate General of Budget, Accounting, and Statistics, 2007, p. 13).

## Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

## Commodity Review

### *Metal*

**Iron and Steel.**—Taiwan was the 12th ranked crude steel producer in the world and the 5th ranked in Asia behind China, Japan, the Republic of Korea, and India. According to the Ministry of Economic Affairs' (MOEA) industrial development plan, Taiwan's crude steel imports would have to increase to 10.3 million metric tons (Mt) in 2015 from about 7 Mt in 2006 to meet domestic demand if crude steel production were to be maintained at the current annual rate of production of about 20 Mt. In 2006, Taiwan consumed about 26 Mt of steel products. The supply and demand gap was met by imports, mainly from China, Japan, and Russia (United Daily News, 2006c).

Taiwan's leading petrochemical producer, Formosa Plastics Group (FPG), had planned to build a 7.5-million-metric-ton-per-year (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. It could take 2 to 3 years for FPG and the EPA to resolve these issues (Taiwan Journal, 2006).

China Steel Corp. (CSC) was the leading steel producer and the only pig iron producer in Taiwan. Without any coal and iron ore resources on the island, CSC depended on imports of coal and iron ore to meet its demand. CSC planned to invest \$6.1 billion to expand production capacity. The investment would increase CSC and its affiliates' total output capacity to 20 Mt/yr of steel during the next 6 years. The investment plan included two blast furnaces, as well as facilities for hot- and cold-rolled steel and wire rods. CSC planned to expand its cold-rolled steel bar and wire output capacity by 2 Mt/yr. Dragon Steel Corp., in which CSC held a 70% share, contracted Siemens AG of Germany to supply a 7,440-metric-ton-per-day sinter plant and a blast furnace with an inner volume of 3,274 cubic meters, which would be able to produce 2.5 Mt/yr of pig iron. In addition to the blast furnace, the contract included a coal-injection system, stoves and electric air blowers, and a top-gas energy turbine for energy recovery and use within the steelworks. The contract also included a 2-strand slab caster, which had an output capacity of 2.6 Mt/yr of high-quality slabs with a thickness of 250 millimeters (mm) and widths of between 950 mm and 1,680 mm. The blast furnace was scheduled to begin production in December 2009 in Taichung. In November 2006, Dragon Steel received approval from the MOEA for the second blast furnace expansion plan and submitted an environmental impact study to the EPA for approval; the company planned to begin construction in 2008 (United Daily News, 2006a).

CSC and Baosteel Corp. of mainland China jointly established Baoshunchang Corp. in Changsu, Jiangsu Province, China. Even though CSC held only 10% of the shares of the joint venture, this was the first cooperation between two leading steel producers across the Taiwan Strait. Other shareholders included Jiangsu Bai Xue Electric Co. and Shanghai Bao Shun Chang Co., which was a joint-venture company of Baosteel and Hong Kong-based Bao Shun Chang Co. The Bao Shun Chang steel plant would produce 100,000 metric tons per year of cold-rolled steel sheet for the Bai Xue electrical appliance plant. CSC also teamed up with Chang Yi Steel Corp. and Japanese companies Maruichi Steel Tube Ltd., Metal One Co., and Toyota Trading Co. to form a joint-venture company, Maruichi Foshan Co., in Guangdong Province, China. CSC was responsible for supplying steel materials to Maruichi Foshan for the production of steel pipes for the automobile manufacturers in southern China. CSC planned to expand its global distribution channel through cooperation with downstream manufacturers. CSC also signed a strategic cooperation agreement with Wuhan Iron and Steel Group Corp. of China in 2006. This alliance could help upgrade the domestic steel industry and could improve international competitiveness (United Daily News, 2007).

### *Industrial Minerals*

**Cement.**—Owing to the restriction of sand and gravel exports from China, the production of cement in Taiwan decreased slightly in 2006. Domestic demand for cement gradually

decreased to about 15 Mt in 2006 from 27.9 Mt in 1993. Exports of cement were 5.32 Mt in 2006 and were shipped mainly to, in descending order of amount shipped, the United States, Nigeria, Singapore, and Kuwait. Taiwan exported a total of 6.72 Mt of cement and clinker. 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 was expected to reach 20.7 Mt/yr in 2008. Demand for high-grade cement in southern China was 120 Mt; local cement producers could supply about 20% to 30% of that demand. Owing to expected increased demand for cement in Europe and India, TCC planned to export cement to European countries in the future and to build a cement plant in India (United Daily News, 2006b).

### *Mineral Fuels*

**Coal.**—Without any coal production, Taiwan depended on imported coal to meet its demand. Taiwan Power Co. (Taipower) was the leading coal consumer on the island and imported about 52% of Taiwan's coal imports. In 2006, Taiwan imported a total of 62.3 Mt of coal; of this total, Indonesia provided 24.21 Mt; Australia, 18.77 Mt; and China, 13.03 Mt. To reduce shipping costs, no coal from South Africa or the United States was imported in 2006. Power generation accounted for 76.17% of total coal consumption. Because of the restart of the CSC No. 2 blast furnace, coal consumption by CSC increased and accounted for 9.42% of total consumption (Bureau of Energy, 2007).

**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. Taiwan Power suspended the construction of the No. 4 nuclear powerplant and 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 (Taiwan Economic News, 2006a).

### **Outlook**

Taiwan's economic growth is expected to continue during the next several years. The service sector accounts for more than 70% of the gross domestic product. With limited mineral resources, the mining sector is expected to have a minimal

impact on the island's economy in the future. The growth of manufacturing is likely to be led by electronics components and computer and telecommunication products sectors. The island relies on imports of raw materials to support its iron and steel and nonferrous metal 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. MOEA has developed guidelines and action plans to promote the knowledge-intensive service sector as the new catalyst for economic growth in the next decade despite fierce global competition. The Taiwan authorities believe that high levels of service sector development could add value to products in the agricultural and manufacturing sectors, improve Taiwan's core competitive edge, and strengthen the industrial sector.

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TABLE 1  
TAIWAN: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity		2002	2003	2004	2005	2006
<b>METALS</b>						
Iron and steel, metal:						
Pig iron	thousand metric tons	10,524	10,779	10,938	9,854	10,500
Steel, crude	do.	18,255	18,832	19,604	18,567	19,203
Nickel, refined <sup>c</sup>		11,000	11,000	11,000	11,000	11,000
<b>INDUSTRIAL MINERALS</b>						
Cement, hydraulic	thousand metric tons	19,363	18,474	19,050	19,891	19,294
Feldspar		--	510	900	--	--
Fire clay		2,083	7,546	3,686	330	125
Lime		503,567	519,782	493,733	443,879	440,000 <sup>c</sup>
Mica		6,595	3,237	2,973	8,608	4,841
Nitrogen, liquid		538,338	534,721	650,359	794,933	800,000 <sup>c</sup>
Salt, marine		56,720	191	--	--	--
Sodium compounds, n.e.s.:						
Caustic soda		508,760	568,180	570,000 <sup>c</sup>	570,000 <sup>c</sup>	570,000 <sup>c</sup>
Soda ash <sup>c</sup>		140,000	140,000	140,000	140,000	140,000
Stone:						
Dolomite	thousand metric tons	55	54	115	174	61
Limestone	do.	3,677	1,434	213	252	351
Marble	do.	23,736	21,041	22,970	24,070	25,493
Serpentine	do.	268	194	229	408	304
Sulfur		212,343	225,006	222,670	267,790	245,789
Talc		27	466	410	--	--
<b>MINERAL FUELS AND RELATED MATERIALS</b>						
Gas, natural:						
Gross	million cubic meters	887	831	796	548	463
Marketed <sup>c</sup>	do.	785	760	720	490	410
Petroleum:						
Crude	thousand 42-gallon barrels	321	288	280	203	148
Refinery products	do.	379,331 <sup>r</sup>	436,531 <sup>r</sup>	490,977 <sup>r</sup>	507,462 <sup>r</sup>	540,000 <sup>c</sup>

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits. <sup>r</sup>Revised. -- Zero.

<sup>1</sup>Includes data available through July 20, 2007.

TABLE 2  
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity <sup>e</sup>
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 Tungtzu-chiao	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

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits.