



2006 Minerals Yearbook

PAPUA NEW GUINEA

THE MINERAL INDUSTRY OF PAPUA NEW GUINEA

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Papua New Guinea is rich in mineral resources. The identified major minerals are cobalt, copper, natural gas, gold, nickel, crude petroleum, and silver. Ore reserves of copper and gold are rich and of world significance. In 2006, mineral production in Papua New Guinea included copper, natural gas, gold, petroleum, and silver. Papua New Guinea ranked fourth in the Asia and the Pacific region in the production of mined copper and gold. It ranked ninth in the production of crude petroleum in the region (Oil and Gas Journal, 2006; International Copper Study Group, 2007, p. 11-12; World Bureau of Metal Statistics, 2007, p. 79).

The Papua New Guinea Department of Mining (DOM) is the main Government agency responsible for regulating, monitoring, promoting, and recording Papua New Guinea mineral exploration and mining activities. The mission of the DOM is to ensure that the country's geologic resources are properly documented, effectively promoted, developed, and managed for the long-term benefit of the people of Papua New Guinea. The DOM comprises the Mining, Geological Survey, and Corporate Services Divisions (Department of Mining, 2006a).

In February 2006, the DOM launched a 3-year airborne geophysical survey and a 5-year geologic mapping and regional geochemical sampling program in the prospective Papua New Guinea Highlands and Papuan Peninsula, where there was no prior geophysical coverage and geologic mapping was sparse. The DOM planned to release the collected data regularly to exploration and mining companies at a nominal cost beginning in 2007. The \$37.6 million¹ (€30 million) program was funded by the European Union (Department of Mining, 2006b).

According to Papua New Guinea's Chamber of Mines and Petroleum, the Mineral Resources Authority (MRA) reportedly was established by the Mineral Resources Authority Act, which was scheduled to become effective beginning on January 1, 2006. The MRA is a statutory agency that would replace the DOM. The implementation of the Act, however, was delayed (Anderson, and Kawagle, 2007, p. 4).

Minerals in the National Economy

Mining was a very important sector of Papua New Guinea's economy. Mineral production accounted for about 21% of the country's gross domestic product (GDP) in 2004 (the latest year for which data were available). Mineral export receipts reportedly accounted for 49.7% of Papua New Guinea's GDP in 2005 (U.S. Department of State, 2007). In 2006, the export value of minerals, which included copper, gold, petroleum, and silver, totaled \$3,415.2 million and accounted for about 83% of total export earnings compared with 75% in 2005 and 73% in 2004 (Bank of Papua New Guinea, 2007).

¹Where appropriate, values have been converted from European Union euros (€) to U.S. dollars (US\$) at a rate of €0.7979=US\$1.00 for 2006.

Production

In 2006, the overall metallic mineral production declined by 4.9% despite the increased world price of copper and gold (Asian Development Bank, 2007). The decline in overall metallic mineral production was owing to the low grade of gold ore being processed from stockpiles at the Porgera Mine, where a landslide at the west wall of the Porgera open pit had adversely affected the total gold mine production in 2006. In 2006, the Ok Tedi Mine remained the sole copper-producing mine; it also produced considerable amounts of gold and silver as byproducts from its copper mining operations. The active primary gold and silver producers in 2006 were, in declining order of gold production, the Lihire Mine, the Ok Tedi Mine, the Porgera Mine, the Tolukuma Mine, the newly opened Kainantu Mine, and several small-scale gold mines. Production of natural gas and crude petroleum from seven gasfields and eight oilfields, which are located in the Provinces of Southern Highlands and Eastern Highlands, increased by between 1% and 2% in 2006 owing mainly to higher world energy prices (table 1).

Structure of the Mineral Industry

Papua New Guinea's mineral industry comprised a small industrial minerals sector, which mined limestone mainly for domestic consumption as aggregate for the surfacing of roads and airstrips and the manufacturing of cement; a medium-sized nonferrous metals mining sector that mined copper, gold, and silver; and a small energy sector that produced and processed natural gas and crude petroleum. In the nonferrous metals mining sector, a copper mining company produced copper, and gold and silver as byproducts and four gold mining companies produced primary gold. In the mineral fuels sector, a domestic oil and gas company, several joint ventures of domestic and foreign oil and gas companies, and a foreign oil refining company produced natural gas, crude petroleum, and refined petroleum products in 2006. The overall capacity of the copper mining industry remained steady during the past 5 years, but gold and silver mining increased slightly because of the opening of a new mine by Highlands Pacific Ltd. in early 2006. The production capacity for oil and gas remained steady during the past 5 years (table 2).

Commodity Review

Metals

Copper.—In 2006, Ok Tedi Mining Ltd. was the sole producer of copper. The company produced copper ore and concentrate from the Ok Tedi Mine, which is located on Mount Fubilan in the remote Star Mountain about 18 kilometers (km) from the border of Papua New Guinea's Western Province and Indonesia's West Papua Province (formerly called Irian Jaya). In

2006, the production of copper contained in copper concentrates increased by 0.7% to 194,355 metric tons (t); the head grades of mined copper and of gold ore were 0.82% and 0.88 gram per metric ton (g/t), respectively. The company sold and exported 622,158 t of copper concentrates, which contained 177,538 t of copper and 15.7 t of gold. Exports of copper concentrate went mainly to China, Germany, India, Japan, the Republic of Korea, and the Philippines. To remove pyrite from mine tailings and to prevent increased water pollution on the Fly River system in the future, the Minister for Environment and Conservation approved the company's \$150 million Mine Waste and Tailings Project in December 2006. The company planned to start implementing the project beginning in the first quarter of 2008 (Ok Tedi Mining Ltd., 2007).

The Frieda copper and gold project was moving closer to the feasibility study stage for the development of one of the world's largest undeveloped copper and gold deposits after Xstrata Frieda River Limited (a subsidiary of Xstrata plc) exercised an option to acquire a 73% interest in the Frieda River project from Highlands Pacific. To continue holding its newly acquired interest in the Frieda River project, Xstrata would have to complete a feasibility study by 2011. Recent drilling at the Nena deposit established measured and indicated mineral resources of 42.7 million metric tons (Mt) at grades of 3.09% copper and 0.59 g/t gold. According to Xstrata, Highlands Pacific was conducting exploration of other high-grade targets in 2006 (Highlands Pacific Ltd., 2007a; Reuters, 2007).

In 1977, the Papua New Guinea Government granted Nautilus Minerals Inc. the world's first deepwater offshore exploration license to explore and evaluate the high-grade copper-gold-silver-zinc seafloor massive sulfide deposits. After more than 6 years of exploration, Nautilus Minerals reportedly expected to sign a Heads of Agreement with one of the world's leading dredging companies to take on the role of mining contractor to build a dedicated deep-sea mining vessel. The company plans to start the mining of Nautilus' Solwara 1 project in late 2009 (Anderson and Kawagie, 2007; Mining Journal, 2007a).

Gold.—In 2006, gold and silver mine production were at the Kainantu Mine (gold), the Lihir Mine (gold), the Ok Tedi Mine (copper, gold, and silver), the Porgera Mine (gold and silver), and the Tolukuma Mine (gold and silver). Highlands Pacific started operations at the Kainantu Mine, which is located in Eastern Highlands Province, in January 2006, but the ramp-up process was slow. According to the Papua New Guinea Chamber of Mines and Petroleum, gold production at the Kainantu, the Porgera, and the Tolukuma Mines in 2006, was lower than the targets because of a landslide of the west wall of the open pit at the Porgera Mine and processing of low-grade stockpile ore at all three mines. For the first 9 months of 2006, gold mine production by operating mine was as follows: the Lihir Mine, 13.2 t; the Ok Tedi Mine, 12.6 t; the Porgera Mine, 8.1 t; the Tolukuma Mine, 0.9 t; the Kainantu Mine, 0.5 t; and small-scale mines, 2.1 t (Anderson and Kawagie, 2007). The Lihir Mine reportedly was to complete construction of an expanded flotation plant early in 2007. As a result, the Lihir gold mine production in 2007 was expected to increase from that of 2006 (Mining Journal, 2007b).

The Sinivit project, which is located in northeastern New Britain, was near completion. According to New Guinea Gold

Corp. (2006, p. 2; 2007, p. 2), the company planned to start mining in the first quarter of 2007, and gold production was expected to start in April 2007. The target gold production for the first 12 months of operation was expected to be about 1.9 t (35,000 ounces). The Hidden Valley gold-silver mine (owned by Harmony Gold Mining Co. Ltd. of South Africa) in the Morobe Province and the Simberi gold mine (owned by Allied Gold Ltd. of Australia) on Simberi Island northwest of Lihir reportedly were in the preliminary construction stage (Anderson and Kawagie, 2007).

Nickel and Cobalt.—After the signing of a Heads of Agreement between Highlands Pacific [through its wholly owned subsidiary Ramu Nickel Ltd. (RNL)], the state-owned Mineral Resources Development Co. (MRDC) of Papua New Guinea, and the Chinese Metallurgical Construction (Group) company (MCC) in February 2004, MCC reportedly started construction of and became the operator of the Ramu Nickel-Cobalt Project. According to the joint-venture agreement that was ratified in October 2005, the joint venture project was owned by MCC RamuNICO Ltd. (a subsidiary of MCC), 85%; RNL, 8.56%; Mineral Resources Ramu Ltd. (a subsidiary of MRDC), 3.94%; and Mineral Resources Madang Ltd. (a landowner company), 2.5% (Highlands Pacific Ltd., 2007b).

The resource at the Ramu nickel and cobalt deposit (Kurumbakari Mine) in Madang Province was estimated to be 143 Mt at an average grade of 1.01% nickel and 0.10% cobalt. According to a feasibility study, the estimated resources at the Ramu nickel and cobalt deposit would have a 20-year mine life based on projected production of 32,800 t/yr of nickel and 3,280 t/yr of cobalt metal contained in a high-grade intermediate product. The capital cost for the development of the Ramu nickel and cobalt project was estimated to be \$800 million, and construction of the processing plant was planned to start in April 2007. In November 2006, Jinlin Nickel Industry Group Ltd. of China reportedly had joined MCC in the Ramu project (Metals Place, 2006; Highlands Pacific Ltd., 2007a).

Mineral Fuels

Natural Gas and Crude Petroleum.—Papua New Guinea's natural gas was produced by Oil Search Ltd. of Papua New Guinea (with Exxon Mobil Corp. of the United States as operator) mainly from the Hides gasfield in Southern Highlands Province. Production of natural gas, which included associated gas from other oilfields and gasfields, including the Agogo, the Gobe Main, the Hedinia, the Kutubu, the Moran, the SE Gobe, and the Usano fields, was mostly reinjected into wells. Only the Hides natural gas production, which totaled about 155 million cubic meters (5,475 million cubic feet) in 2006, was tapped to a power station at Hides. Crude petroleum produced by Chevron Niugini Ltd. was mainly from the Central Moran oilfield, the Gobe oilfield, and the Kutubu oilfield in Southern Highlands Province and from onshore Papua Basin. Santos Ltd. also produced a smaller quantity of crude petroleum from the SE Gobe Oilfield in Southern Highlands Province and from Papua Basin.

Papua New Guinea's first and only oil refinery was completed and brought onstream by InterOil Corporation of Canada

at an estimated cost of \$214 million in 2004. The refinery, which was located in the Port Moresby area, had a capacity of 32,500 barrels per day (bbl/d). The refinery comprised an atmospheric distillation unit and a 3,500-bbl/d catalytic reformer for production of gasoline blend stock. In 2006, after meeting all domestic requirements for refined petroleum products, the refinery exported about 50% of its production to the surrounding countries. Before 2005, the country imported all its refined petroleum products from Australia and Singapore (InterOil Corporation, 2007, p. 20).

Outlook

Papua New Guinea's economy was forecasted to grow steadily at a rate of 4.3% in 2007 and 3.7% in 2008 (International Monetary Fund, 2007). Activity in the mining sector is expected to increase gradually as the Hidden Valley Mine in Morobe Province, the Simberi Mine on Simberi Island, and the Sinivit Mine in New Britain begin to produce gold and expansion of the processing facilities at the Lihir and the Kinantu Mines is completed. However, a future decline in the prices of copper could have a negative impact on the growth of the mining sector. In the next 3 to 5 years, other positive factors for the continuing growth in the mining sector are likely to be the development of the Frieda Copper-Gold Project and Ramu Nickel-Cobalt Project.

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TABLE 1
PAPUA NEW GUINEA: PRODUCTION OF MINERAL COMMODITIES¹

Commodity ²		2002	2003	2004	2005	2006 ^c
Copper, mine output, Cu content	metric tons	204,000	202,300 ^r	173,370 ^r	192,978 ^r	194,355 ³
Gas, natural, marketed	million cubic meters	106 ^r	139 ^r	156 ^r	154 ^r	155 ³
Gold, mine output, Au content	kilograms	61,379	67,832	73,670 ^r	68,483 ^r	50,000
Petroleum, crude	do.	16,563 ^r	17,822 ^r	15,495 ^r	17,113 ^r	17,300
Silver, mine output, Ag content	do.	63,349	61,900	55,600 ^r	51,125 ^r	50,000

^cEstimated; estimated data are rounded to no more than three significant digits. ^rRevised.

¹Table includes data available through June 15, 2007.

²In addition to the commodities listed, cement and crude construction materials (common clays, sand and gravel, and stone) are produced, but available general information is inadequate to make reliable estimates of output.

³Reported figure.

Sources: U.S. Geological Survey, Minerals Questionnaire 2001-03. British Geological Survey, World Mineral Production 2000-04. Papua New Guinea Chamber of Mines and Petroleum, Papua New Guinea Mineral Production, 2003-2005; Papua New Guinea Oil Production, 2002-2005; Papua New Guinea Gas Production 2002-2005, December 19, 2005, and Statistics—Worldwide Crude Oil and Gas Production, March 12, 2006.

TABLE 2
PAPUA NEW GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c
Cement	thousand metric tons	Papua New Guinea-Halla Cement Pty. Ltd. (Halla Cement Corp. of the Republic of Korea, 50%, and Government, 50%)	Lae, Morobe Province	200
Copper	do.	Ok Tedi Mining Ltd., operator [National Papua New Guinea Sustainable Development Program Ltd., 52%; Government, 30%; Inmet Mining Ltd. (Canada), 18%]	Ok Tedi open cut, Western Province, 20 kilometers northwest of Tabubil and 390 kilometers southwest of Wewak	210
Gold		Lihir Gold Ltd., operator, 100%	Lihir open cut, Lihir Island, New Ireland Province, 700 kilometers northeast of Port Moresby	19
Do.		Highlands Pacific Ltd., 95%	Kainantu underground mine, Eastern Highlands Province, 180 kilometers west of Port Lae	4
Do.		Ok Tedi Mining Ltd. [National Papua New Guinea Sustainable Development Program Ltd., 52%; Government, 30%; Inmet Mining Ltd. (Canada), 18%]	Ok Tedi open cut, Western Province, 20 kilometers northwest of Tabubil and 390 kilometers southwest of Wewak	20
Do.		Porgera Joint Venture [Placer Dome Inc. (Canada) (the operator), which was a subsidiary of Barrick Gold Corp. (Canada), 75%; Orogen Minerals Ltd., 20%; and Mineral Resources Porgera Pty. Ltd., 5%]	Porgera open cut and underground mines, 620 kilometers northwest of Port Moresby, Enga Province	28
Do.		Tolukuma Gold Mine, Papua New Guinea [wholly owned subsidiary of Emperor Mines Ltd. (Australia), which was 78.72% owned by DRDGOLD Ltd. (South Africa)]	Tolukuma underground mine and small open pit, Central Province, 100 kilometers north of Port Moresby	3
Natural gas	thousand cubic meters per day	ExxonMobil Corp. (operator) (Oil Search Ltd. 21.5%)	Hides Gasfield, Southern Highlands Province. Onshore Papuan Basin, petroleum development license	427
Petroleum:				
Crude	thousand 42-gallon barrels per day	Petroleum development license 2: Chevron Niugini Ltd. (operator and manager), 19.37%; Oil Search (Kutubu) Ltd., 27.14%; Orogen Minerals Ltd., 25.44%; ExxonMobil Corp., 14.52%; Petroleum Resources (Kutubu) Ltd., 6.75%; Merlin Petroleum Co., 6.78%. Petroleum development license 5: ExxonMobil Corp. (operator and manager), 47.5%, and Oil Search Ltd., 52.5%	Central Moran oilfield, Southern Highlands Province (includes Agogo and Iaqufi-Hedinia Fields). Onshore Papuan Basin, petroleum development licenses 2 and 5	15
Do.	do.	Chevron Niugini Ltd. (operator and manager), 19.37%; Oil Search Ltd., 27.14%; Orogen Minerals Ltd., 30.19%; ExxonMobil Corp., 14.52%; Merlin Petroleum Co., 6.78%; Petroleum Resources Ltd. (Gobe), 2.0%	Gobe Main oilfield, Southern Highlands Province. Onshore Papuan Basin, petroleum development license 4	10
Do.	do.	Chevron Niugini Ltd. (operator and manager), 19.37%; Oil Search Ltd., 27.14%; Orogen Minerals Ltd., 25.44%; ExxonMobil Corp., 14.52%; Petroleum Resources (Kutubu) Pty. Ltd., 6.75%; Merlin Petroleum Co., 6.78%	Kutubu oilfield, Southern Highlands Province. Onshore Papuan Basin, petroleum development license 2	50
Do.	do.	Santos Ltd. (operator and manager), 15.5%; Southern Highlands Petroleum Ltd., 39.14%; Orogen Minerals Ltd., 20.5%; Oil Search Ltd., 15.50%; Cue PNG Oil Co. Ltd., 5.42%; Petroleum Resources (Gobe) Ltd., 2.0%; Mountains West Exploration, Inc., 1.94%	SE Gobe oilfield, Gulf and Southern Highlands Provinces. Onshore Papuan Basin, petroleum development licenses 3 and 4	10
Refinery products	do.	InterOil Corp. (Canada)	Port Moresby	33

See footnotes at end of table.

TABLE 2—Continued
 PAPUA NEW GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c
Silver	do.	Ok Tedi Mining Ltd. (operator) [National Papua New Guinea Sustainable Development Program Ltd., 52%; Government, 30%; Inmet Mining Ltd. (Canada), 18%]	Ok Tedi open cut, Western Province, 20 kilometers northwest of Tabulio and 390 kilometers southwest of Wewak	40
Do.	do.	The Porgera Joint Venture [Placer Dome Inc. (Canada) (operator), which was a subsidiary of Barrick Gold Corp. (Canada), 75%; Orogen Minerals Ltd., 20%; Mineral Resources Porgera Pty. Ltd., 5%]	Porgera open cut and underground mines 620 kilometers northwest of Port Moresby, Enga Province	8
Do.	do.	Tolukuma Gold Mine, Papua New Guinea (wholly owned subsidiary of Emperor Mines Ltd. (Australia), which was 78.72% owned by DRDGOLD Ltd. (South Africa)]	Tolukuma underground mine and small open pit, Central Province, 100 kilometers north of Port Moresby	6

^cEstimated.