The mineral industry was the cornerstone of the country's economy in 1994, as it had been since 1972 when the world-class Panguna porphyry copper-gold deposit on Bougainville Island in North Solomons Province concluded its first full year of production. The country's gross domestic product (GDP) rose for the third successive year, growing at a rate of 3% in 1994. The minerals sector, however, including exploration programs, mining, and the associated construction and development undertakings, declined for the first time in 4 years.

Mining consisted of large, modern, mechanized operations, such as the Ok Tedi copper mine in Western Province and the Misima opencut and Porgera underground-open pit gold operations in Milne Bay and Enga Provinces, respectively, as well as panning and crude sluicing activity by individuals and small gold mining companies.

Government Policies and Programs

The Government announced on December 8 that it was planning to divest all of its equity shares in the country's resource projects. Only a month earlier, the Government announced the reversal of its previous mineral resource policy by proposing to reduce a part of its holdings in the country's three largest resource undertakings—the Kutubu oil project, the Ok Tedi Mine, and the Porgera joint-venture operation. Although the details were not finalized by yearend as to how and when the Government would sell off its interests in the various projects, the Government did explain that it would still acquire its legal entitlement of 30% in all new mining projects and 22.5% in all new petroleum projects by paying its share of sunk costs, but would then sell the equity holdings. Initial negotiations with the local landowners were to resolve the equity that they wanted and were able to pay for, with preference then given to selling to other Papua New Guineans prior to seeking new foreign investors.

In addition, the Government's taking last year of an additional 15% equity in the Porgera Mine was to be abandoned because the Government had not paid its negotiated settlement price of almost $139 million and still did not have the funds to do so.

Environmental Issues

Mining-related environmental matters were legislated under several statutes, including the following, noting the year of original enactment: the Environmental Planning Act (EPA), 1978; the Environmental Contaminants Act, 1978; the Conservation Areas Act, 1978; the Water Resources Act, 1982; and the National Parks Act, 1982.

The EPA required a review of the potential environmental impact of all natural resource extraction and industrial- and human-development projects. If significant environmental or social impacts were foreseen, then an environmental plan, similar to a U.S. environmental impact statement, must be prepared describing any expected changes and the measures to be taken to minimize such changes. The environmental plan must be included as part of the feasibility study and include the details of all measures to be taken to safeguard the environment, including plans for rehabilitation.

Under the EPA, the responsibility for monitoring the impact on the environment from mining activities lay with the Department of Environment and Conservation (DEC). Until 1993, the country's first two modern, world-class mining operations, the Panguna and Ok Tedi copper mines, were specifically excluded from the requirements of the Act because of their precedency. These mines were operated under contractual arrangements specifically developed for each of them in 1974 and 1976, respectively, and the Department of Mining and Petroleum, rather than the DEC, was responsible for their environmental monitoring. The Government transferred in midyear 1993 the environmental responsibility for the Ok Tedi Mine to the DEC. This left, at least theoretically because of its total closure since May 1989, the country's first large-scale mine at Panguna as the only one not legislated to be monitored for its impact on the environment by the DEC.

Production

Three mines (Misima, Ok Tedi, and Porgera), one gas project (Hides), and two petroleum fields (Agogo and Iagifu-Hedinia) were in operation at the end of the year. These produced virtually all of the country's mineral production, excluding minor amounts of alluvial gold by individual panners and clays, sand and gravel, and stone for construction purposes. A fourth mine, the Panguna,
remained closed throughout the year owing to civil unrest by Bougainville Revolutionary Army militants. (See table 1.)

**Trade**

Papua New Guinea has developed from a country dominated by subsistence agriculture and the export of the unrivaled cash crops of cocoa, coffee, and copra and palm oils in the early 1980's to one in which minerals and petroleum represent about 70% of the country's export revenues. Papua New Guinea remained the sixth largest exporter of gold in the world in 1994, primarily shipping to the Perth, Western Australia, refinery and mint.

Gold from the Porgera Mine continued to account for about 40% of all export revenues and 10% of the Government's income. Virtually all nonfuel mineral production was exported in the form of doré, bullion, and copper-gold-silver concentrates.

All petroleum production was exported from the marine export terminal in the Gulf of Papua and sold to refineries in Australia, Japan, and Southeast Asia.

**Structure of the Mineral Industry**

Papua New Guinea is a mineral-rich country with a modern mining industry. Mining was the only large-scale industry in the country, directly accounting for more than 30% of the GDP, estimated at $5.6 billion. In addition to several large, world-class mining operations, there were numerous small-scale mining activities. The country has had a long history of mining, beginning in 1888 with the discovery of gold on what is now Misima Island, and was a world-class producer of copper and gold, ranking 10th in copper and 8th in gold, in 1994. (See table 2.)

**Commodity Review**

**Metals**

_Copper._—Since the closure of Bougainville Copper Ltd.'s Panguna Mine on Bougainville Island in North Solomons Province in 1989, all of the country's copper production continued to be from the Ok Tedi Mine on Mount Fubilan in the Star Mountains of Western Province, 18 kilometers (km) east of the border with the Indonesian Province of Irian Jaya.

Virtually all the landowners living along the Ok Tedi and Upper, Middle, and Lower Fly Rivers were joined during the year in a lawsuit originally launched on May 5 by a Miripiki chief representing his clan of about 30 people. The original writ was filed in Australia's Victorian State Supreme Court on behalf of the Papua New Guineans by the Australian specialist law firm Slater and Gordon of Melbourne, Victoria. The lawsuit sought compensation for alleged environmental damage resulting from the dumping of tailings from the Ok Tedi Mine into the Fly River system via the Ok Tedi River. The nearly $3 billion suit was filed against BHP Minerals Holdings Pty. Ltd., the managing shareholder of the Ok Tedi Mine that has its headquarters in Melbourne. May 15 marked the 10th anniversary of mining at Ok Tedi, a decade in which the operation became one of the world's leading producers and exporters of copper concentrate, accounting for more than 15% of Papua New Guinea's total merchandise exports, including all of its copper and about 15% of its gold.

_Gold._—Progress toward acquisition of the Special Mining Lease (SML) for the Lihir prospect on Lihir Island, 600 km northeast of the Papua New Guinea mainland in New Ireland Province, remained stalled throughout 1994 as it had in 1993. However, the Government announced at yearend that the long-awaited SML would be granted by February 28, 1995. Development of the mine originally was due to commence in 1993, but internal wrangling within the previous Government administration over equity shares delayed issuance of the SML, which, in turn, held up the start of mine construction.

Although at yearend the Lihir joint-venture project remained owned 80% by Kennecott Explorations (Australia) Ltd. (KEA), a subsidiary of the British-owned RTZ Corp., and 20% by locally-based Niugini Mining Ltd. (NML), it was expected that the Government would acquire its full 30% authorized stake in the $625 million project and then sell up to a 20% share to local landowners. KEA was expected to retain a 40% stake in Lihir, but make a 10% indirect interest available to Venezuelan Goldfields Inc. (Vengold), a Canadian junior mining company. NML was expected to raise its equity share in the project to 30%. Development of the Lihir Mine was to be financed entirely by bank loans and a public float of Lihir Gold Ltd., the managing-holding company. Development was expected to take up to 28 months.

The Misima open pit mine, 190 km east of the Papua New Guinea mainland on Misima Island, continued to operate at peak performance with high production rates and low operating costs. Gold production exceeded forecasts made early in the year, primarily due to higher-than-expected ore grades mined from the Kulumalia pit. The Kulumalia pit was developed early in the year as a source of soft ore to supplement harder ore mined at the main pit. The Kulumalia pit was essentially mined out by yearend, producing a total of 3.6 million metric tons (Mmt) of ore grading 1.56 grams per metric ton, about 25% higher than predicted. The Ewatinona pit, assessed at about 1.6 Mmt of soft, high-grade ore containing about 2,800 kilograms (kg) of gold, was being developed at yearend to replace the depleted Kulumalia pit.

Australia's Ramsgate Resources Ltd., via its 62%-owned subsidiary Oakland Pty. Ltd., won in conjunction with the local landowner group Kare-Puga Development Corp. (KDC) the hardrock mining rights at Mount Kare, 18 km southwest of the Porgera Mine. Papua New Guinea's National Court confirmed early in the year that KDC held the title to the highly prospective Mount Kare hardrock gold prospect. The title had been relinquished more than a year earlier by CRA Minerals (PNG) Pty. Ltd. when CRA
transferred to KDC the SML for the Mount Kare alluvial-
colluvial gold prospect it had previously held in Enga
Province. Oak, under its agreement with KDC, had a
90% interest in the hardrock rights and 40% of the alluvial
rights.

Ramsgate entered into an agreement with Vengold that
secured funding for the next stage of development at the
Mount Kare project. Vengold was to spend $5 million on
development in return for the right to buy into Ramsgate's
Oakland subsidiary. Ramsgate, in addition to its 62%
interest, had an option over a further 35% owned by Menzies
Gold NL. Under this agreement, Vengold would be able to
progressively purchase up to a 71% equity in Oakland, with
Ramsgate then holding 26%, and Menzies the remaining
3%.

Gold production of 32,123 kg at the Porgera Mine, 130
km west of Mount Hagen and 600 km northwest of Port
Moresby in Enga Province, was in line with forecasts made
at the beginning of the year despite disruptions following a
deadly explosion at the explosive facility and lower-than-
predicted production from the underground East Zone that
commenced early in the year.

The contractor-operated Dyno Wesfarmers Ltd.'s explosive
manufacturing facility was destroyed August 2 by a blast that
killed 11 people and severely interrupted operations at the
mine site. Full production at the mine was not resumed until
August 14. The subsequent statutory Government inquiry
concluded that the explosion was initiated in a pump used in
the manufacturing process.

The Porgera deposit was mined by both underground and
open pit mining methods. The high-grade section of the ore
body was mined underground using long-hole stoping
methods. Underground production was extended into two
new zones during the year to maximize production. The East
Zone was brought into production early in the year, but
mining difficulties hindered production. Ore production in
the West Zone commenced during the last quarter with ore
grades as expected and mining conditions considered good.

The staged expansion of the mine continued to offset
declining ore grades and output benefited from the first full
year of production since completion of the Stage 4A
expansion in the final quarter of 1993. Stage 4B of the
expansion was approved in mid-November and was to
include an additional semiautogenous grinding mill and a
large ball mill, a 300-metric-ton-per-day (mt/d) oxygen plant,
and increased flotation, leaching, and lime production
capacities, as well as an increase in power production at the
natural gas generating station adjacent to the Hides Gasfield
in Southern Highlands Province and the process water
storage capacity at the Waile Creek Dam. Open pit
production capacity, increased from 60,000 mt/d to 100,000
mt/d during 1994, was to be expanded further to 150,000
mt/d in late 1995 to meet projected throughput from the
Stage 4B expansion that was expected to be completed early
in 1996. Grinding plant capacity after completion of Stage
4B was to increase from the yearend 1994 rate of 10,000
mt/d to 17,700 mt/d.

Union Mining NL, operator-manager with a 51% interest,
and Macmin NL, 49%, were granted in the last quarter of
1994 a mining lease by the Department of Mining and
Petroleum to develop the Wapoluti Gold Project on Ferguson
Island, 350 km east of Port Moresby in Milne Bay Province.
Production was expected to commence from the Dagwalala
and Didigayagaya pits in midyear 1995 at a rate of
approximately 1,000 kg per year of gold.24

Mineral Fuels

Natural Gas.—BP Petroleum withdrew from negotiations
with Japan's Marubeni Corp. after failing to reach agreement
on final terms for the sale of its natural gas exploration and
production interests in Papua New Guinea. The pullout was
considered a blow to the country's hopes of establishing a $5
billion to $10 billion liquefied natural gas (LNG) export
project based on production from the Hides natural gasfield.25
BP had been considering a joint venture with Exxon Inc. of
the United States to construct an LNG plant using natural
gas from the massive Hides Field.

Petroleum.—The Kutubu joint-venture petroleum project
in Gulf and Southern Highlands Provinces of the Papuan
Basin reached on October 14 the production milestone of
100 million barrels (bbl) produced since output started on
June 21, 1992. Production levels averaged approximately
130,000 barrels per day (bbl/d) during 1994, a slight decline
from that of 1993. The Kutubu joint-venture was producing
from the Agogo Oilfield, discovered in 1989, and the Iagifu-
Hedina Oilfield, discovered in 1986.

The Government signed in December an agreement for the
construction by PNG Oil Refinery Pty. Ltd. of the planned
$190 million oil refinery on Motukea Island in Fairfax
Harbour, near Port Moresby. The refinery was to be able to
process 30,000 bbl/d of crude using conventional processing
technology. Oil from the Kutubu Project was to be used as
the main component, although other light crudes also would
be able to be refined. The refinery, in addition to direct
import substitution, would establish a valued-added industry
of 12.5% and provide employment for 250, mainly local,
people. PNG Oil Refinery, a consortium of several firms
from Australia, Papua New Guinea, and the United States,
allocated between 40% and 60% of the equity for Papua New
Guinea institutions and landowners. Construction was slated
to begin by mid-1995.

The country's only refinery, the small topping Iagifu Ridge
Refinery 200 meters above Lake Kutubu, obtained a variance
to its license in the last quarter of the year, enabling it to sell
its products within the country. Previously, it could only
produce a small quantity of aviation and diesel fuels used in
conjunction with the Kutubu project itself.

Reserves

Papua New Guinea, part of the largest of the islands of
Oceania, also had the greatest share of Oceania's mineral
resources. However, only three major nonfuel mineral commodities—copper, gold, and silver—were produced. Although there was no immediate prospect of other major commodities being produced on a large scale, subeconomic resources of chromium, cobalt, and nickel were known. Mineral sands containing magnetite and titanomagnetite occurred at many locations around the coasts of Papua New Guinea. Minor quantities of platinum-group metals have been recovered from alluvial gold workings. Resources of bauxite were known on Manus Island in the Admiralty Islands and on New Ireland Island. In addition, lead, manganese, molybdenum, and zinc mineralization, as well as occurrences of industrial minerals, such as limestone, phosphate guano, and phosphate rock, were known.

Natural gas and petroleum potential was thought to be large, but proven reserves were only starting to be delineated. (See table 3.)

Infrastructure

Essential elements of the transportation infrastructure included 19,200 km of roads, including 640 km paved; 10,960 km gravel, crushed stone, or stabilized-soil surface; and 7,600 km unimproved earth. The length of inland waterways totaled about 10,940 km and was of little importance to the transportation industry. There were 18 principal airports with permanent-surface runways out of an aggregate of 504 in the country. International shipping ports included Lae, Madang, Port Moresby, and Rabaul, although operations were terminated indefinitely at the latter because of volcanic eruptions in September. There were no railroads. Electric generating capacity was 400 megawatts.

The vast majority of the in-place infrastructure in the country was concentrated in the Provincial capitals; therefore, the lack of infrastructure for most of the country remained a distinct hinderance for the minerals industry, including exploration, mine construction and development, and transportation of mined products.

Outlook

The terrorist activity that forced the closure of the Panguna Mine in May 1989, although contained, was still present. However, the security situation appeared to be improving and a resumption of mining at the property may be possible in the foreseeable future, although at considerable monetary expense.

Local dissidence and landowner unrest at some mining-prospecting sites, such as occurred previously at Mount Kare and was incipient at other sites, appeared to be escalating along with the already prolific urban street crime.

These types of turmoil continued to make potential foreign investors anxious, thus slowing the initiation of new projects and affecting the tranquility at established projects. In addition, the Government's recent propensity to increase somewhat imperiously its equity share in some projects also has reduced investor confidence in the country.

The Government of Papua New Guinea, however, seemed determined to improve the country's investment climate and was beginning to reestablish plans for sound mineral property development by trying to reduce exposure to risk to foreign investors.
TABLE 1
PAPUA NEW GUINEA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper, mine output, Cu content metric tons</td>
<td>170,000</td>
<td>204,000</td>
<td>193,000</td>
<td>204,000</td>
<td>206,000  250,000</td>
</tr>
<tr>
<td>Gold, mine output, Au content kilograms</td>
<td>31,900</td>
<td>60,800</td>
<td>71,200</td>
<td>60,600</td>
<td>59,300   71,200</td>
</tr>
<tr>
<td>Petroleum, crude thousand 42-gallon barrels</td>
<td>--</td>
<td>--</td>
<td>19,400</td>
<td>46,400</td>
<td>43,900   50,000</td>
</tr>
<tr>
<td>Silver, mine output, Ag content kilograms</td>
<td>115,000</td>
<td>125,000</td>
<td>95,500</td>
<td>96,100</td>
<td>75,700   125,000</td>
</tr>
</tbody>
</table>

e/ Estimated. r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits.
2/ Table includes data through May 5, 1995.
3/ In addition to the commodities listed, crude construction materials (common clays, sand and gravel, and stone) are produced, but output is not reported quantitatively, and available general information is inadequate to make reliable estimates.
<table>
<thead>
<tr>
<th>Commodity</th>
<th>Major operating companies and major equity owners</th>
<th>Location of main facilities</th>
<th>Annual capacity e/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>Ok Tedi Mining Ltd., operator. [BHP Minerals Holdings Pty. Ltd., managing shareholder, 52%; Mineral Resources Development Co. (State of Papua New Guinea), 30%; and Metall Mining Corp. of Canada, 18%]</td>
<td>Ok Tedi Mine, Mount Fubilan, Western Province</td>
<td>145</td>
</tr>
<tr>
<td>Do.</td>
<td>Bougainville Copper Ltd., operator and manager. [CRA Ltd., 53.6%; public shareholders, 27.3%; and Mineral Resources Development Co. (State of Papua New Guinea), 19.1%]</td>
<td>Panguna Mine, Bougainville Island, North Solomons Province 1/</td>
<td>180</td>
</tr>
<tr>
<td>Gold</td>
<td>Lihir Joint Venture, operator and manager. [Kennecott Explanations (Australia) Ltd., 80%; Niugini Mining Ltd., 20%]</td>
<td>Lihir project, Lihir Island, New Ireland Province 2/</td>
<td>18</td>
</tr>
<tr>
<td>Do.</td>
<td>Oakland Pty. Ltd., operator and manager, 90%, and Kare-Puga Development Corp. (local landowner group), 10%</td>
<td>Mount Kare deposit, 18 kilometers southwest of the Porgera Mine, Southern Highland Province</td>
<td>5</td>
</tr>
<tr>
<td>Do.</td>
<td>Ok Tedi Mining Ltd., operator. [BHP Minerals Holdings Pty. Ltd., managing shareholder, 52%; Mineral Resources Development Co. (State of Papua New Guinea), 30%; and Metall Mining Corp. of Canada, 18%]</td>
<td>Ok Tedi Mine, Mount Fubilan, Western Province</td>
<td>15</td>
</tr>
<tr>
<td>Do.</td>
<td>Bougainville Copper Ltd., operator and manager. [CRA Ltd., 53.6%; public shareholders, 27.3%; and Mineral Resources Development Co. (State of Papua New Guinea), 19.1%]</td>
<td>Panguna Mine, Bougainville Island, North Solomons Province 1/</td>
<td>10</td>
</tr>
<tr>
<td>Silver</td>
<td>Misima Mines Pty. Ltd., operator and manager. [Placer Niugini Pty. Ltd., 80%; and Mineral Resources Development Co. (State of Papua New Guinea), 20%]</td>
<td>Misima Mine, Misima Island, Milne Bay Province</td>
<td>100</td>
</tr>
<tr>
<td>Do.</td>
<td>Ok Tedi Mining Ltd., operator. [BHP Minerals Holdings Pty. Ltd., managing shareholder, 52%; Mineral Resources Development Co. (State of Papua New Guinea), 30%; and Metall Mining Corp. of Canada, 18%]</td>
<td>Ok Tedi Mine, Mount Fubilan, Western Province</td>
<td>30</td>
</tr>
<tr>
<td>Natural gas</td>
<td>BP Petroleum Development Ltd., operator and manager, 92.5%, and Oil Search Ltd., 7.5%</td>
<td>Hides Gasfield, Southern Highlands Province</td>
<td>425</td>
</tr>
<tr>
<td>Petroleum</td>
<td>thousand cubic meters per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do.</td>
<td>Barracuda Pty. Ltd., operator and manager, 20%. Southern Highlands Petroleum, 50%; Oil Search Ltd., 20%; Nomenco PNG Oil Co., 7%; and Mountains West Exploration Inc., 3%</td>
<td>South East Gobe Oilfield, Gulf Province</td>
<td>40</td>
</tr>
</tbody>
</table>

e/ Estimated.
1/ Closed since May 1989 because of civil unrest.
2/ Waiting for Special Mining Lease to be issued by the Government, enabling development of project to proceed.
<table>
<thead>
<tr>
<th>Commodity, deposit, and location</th>
<th>Reserves e/</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Copper:</strong></td>
<td></td>
</tr>
<tr>
<td>Nena (Frieda River), West Sepik Province</td>
<td>32 million tons ore grading 2.3% copper.</td>
</tr>
<tr>
<td>Ok Tedi, Western Province</td>
<td>510 million tons ore grading 0.69% copper.</td>
</tr>
<tr>
<td>Panguna, North Solomons Province</td>
<td>710 million tons ore grading 0.4% copper.</td>
</tr>
<tr>
<td>Wafi, Morobe Province</td>
<td>19 million tons ore grading 1.4% copper.</td>
</tr>
<tr>
<td><strong>Gold:</strong></td>
<td></td>
</tr>
<tr>
<td>Lihir, New Ireland Province</td>
<td>188 million tons ore grading 3.6 grams gold per ton.</td>
</tr>
<tr>
<td>Misima, Milne Bay Province</td>
<td>35.7 million tons ore grading 1.21 grams gold per ton.</td>
</tr>
<tr>
<td>Mount Kare, Enga Province</td>
<td>3 million cubic meters alluvium grading 5 grams gold per cubic meter.</td>
</tr>
<tr>
<td>Nena (Frieda River), West Sepik Province</td>
<td>32 million tons ore grading 0.58 gram gold per ton.</td>
</tr>
<tr>
<td>Ok Tedi, Western Province</td>
<td>510 million tons ore grading 0.63 gram gold per ton.</td>
</tr>
<tr>
<td>Panguna, North Solomons Province</td>
<td>710 million tons ore grading 0.49 gram gold per ton.</td>
</tr>
<tr>
<td>Porgera, Enga Province</td>
<td>65.4 million tons ore grading 4.6 grams gold per ton.</td>
</tr>
<tr>
<td>Tolukuma, Central Province</td>
<td>700,000 tons ore grading 13.3 grams gold per ton.</td>
</tr>
<tr>
<td>Wafi, Morobe Province</td>
<td>19 million tons ore grading 1.9 grams gold per ton.</td>
</tr>
<tr>
<td>Wapolu, Milne Bay Province</td>
<td>2 million tons ore grading 2.4 grams per ton.</td>
</tr>
<tr>
<td><strong>Petroleum:</strong></td>
<td></td>
</tr>
<tr>
<td>Hides Gasfield, Southern Highlands Province</td>
<td>6 trillion cubic meters recoverable natural gas.</td>
</tr>
<tr>
<td>Kutubu Project (Agogo and Iagifu/Hedinia Oilfields), Gulf and Southern Highlands Provinces</td>
<td>275 million barrels recoverable petroleum.</td>
</tr>
<tr>
<td><strong>Silver:</strong></td>
<td></td>
</tr>
<tr>
<td>Misima, Milne Bay Province</td>
<td>35.7 million tons ore grading 11.0 grams silver per ton.</td>
</tr>
<tr>
<td>Panguna, North Solomons Province</td>
<td>530 million tons ore grading 1.18 grams silver per ton.</td>
</tr>
<tr>
<td>Porgera, Enga Province</td>
<td>585 tons recoverable silver.</td>
</tr>
<tr>
<td>Tolukuma, Central Province</td>
<td>700,000 tons ore grading 37 grams silver per ton.</td>
</tr>
</tbody>
</table>

e/ Estimated.