THE MINERAL INDUSTRY OF

MADAGASCAR

By George J. Coakley

Chromite and graphite remained the most significant minerals produced in Madagascar in 1995. In addition to these minerals, the Malagasy mining industry produced small quantities of gold, rare earths, and some industrial mineral commodities, including cement, feldspar, a variety of semiprecious gemstones, quartz and salt. Production of petroleum remained modest, while exploration for hydrocarbon resources continued. The Republic of Madagascar is a large island located about 420 kilometers east of Mozambique in the Indian Ocean with an area of 581,540 square kilometers (km^2). The area supported a population of 13.8 million and a 1994 estimated gross domestic product per capita of $790.[1]

The Government continued to plan for the liberalization and privatization of aspects of the economy. Along this line, the Malagasy parliament passed a new petroleum law in 1995, a summary of which is available in the 1996 International Petroleum Encyclopedia. The Government had nationalized all mineral resources, with the exception of graphite and mica, in 1975.

A scheduled revision of the 1990 mining permits code had yet to take place despite a rejection of the current mining code by operators in 1994. Portions of a World Bank loan were planned for the creation of another Government agency, the Technical Assistance Bureau for Mining Operators (BATEM), which would function under the guidance of France's Bureau de Recherches Geologiques et Minieres. The Mining Code, Law No. 90-017 of 1990, which revised and augmented the earlier Law No. 89/007 of December 12, 1989, makes provisions for three types of mining permits. The permits are further subdivided into exploration and exploitation permits. Exploration and exploitation type 1 permits were granted only to individuals or groups of Malagasy nationality and were valid for 2 years. Type 2 and type 3 permits, valid for 3 and 5 years, respectively, are designed for small to large mining companies incorporated under Malagasy law. Under the mining code, the maximum size areas of type 2 and type 3 exploration permits are 400 km^2 and 1,000 km^2, respectively. Following a 75% reduction in land holdings during the exploration phase, the next type 2 and type 3 exploitation permits allow for maximum holdings of 100 km^2 and 200 km^2, respectively.

According to Mbendi Information Services, the state-owned, Office des Mines Nationales et des Industries Stratégiques (OMNIS) opened the country's entire onshore and offshore areas for petroleum exploration in the country's first formal licensing round in March 1995. It also revised its petroleum fiscal terms to bring them in line with the favorable conditions available in other frontier exploration areas in Africa.[2]

The Petroleum Code, Law No. 80-001 of June 6, 1980, provides for two different types of production-sharing contracts. The first type of contract covers equity ventures between foreign oil operators and OMNIS. The Government maintains 51% ownership, and cost and production-sharing are financed by income tax payments and royalties based on achieved rates of return.

During 1995, the Government continued to plan for the privatization and reform of certain state-owned commercial ventures, including petroleum refining and distribution. The privatization process is expected to take 2 to 3 years to complete. These plans include restructuring Solitany Malagasy (SOLIMA), which operates the petroleum refinery at Tamatave. The Tamatave refinery, which was severely damaged by a typhoon in April 1994, continued to operate at a reduced capacity in 1995.

QIT-Fer et Titane Inc (QIT), a subsidiary of RTZ Corporation, PLC in the United Kingdom has conducted extensive field studies on the social and environmental aspects of a proposed mining project for titanium minerals in southern Madagascar since 1987. The company reported that QIT expects the project will be the subject of a comprehensive Environmental Review Process prior to any commencement of mining operations. In parallel over the past years, QIT and the Government of Madagascar have been conducting negotiations to conclude a Framework Agreement to support the development of the proposed mining project in the event of a favorable outcome from the environmental review process. This agreement will aim to incorporate the salient features of existing Madagascar laws and investment codes as well as features that would provide the legal, fiscal and other assurances that will be needed to secure financing for the project. Against a backdrop of political change and policy evaluation which has been ongoing since 1991, it has been difficult for QIT and the Government negotiators to finalize the Framework Agreement for the proposed project. As a result, it is difficult to predict a schedule for development.

The Government continues to seek multilateral and bilateral cooperation to aid in controlling the degradation of

the environment incurred during the past few years. Uncontrolled slash-and-burn cultivation, deforestation, livestock overgrazing, and massive erosion threatened Madagascar's agricultural and hydroelectric potential and the country's unique wildlife.

Estimates of 1995 production levels of all mineral commodities are shown on Table 1. Mineral exports must be authorized by the Ministry of Energy and Mines (MEM), with the exception of mineral samples associated with exploration. Significant amounts of gold and semiprecious stones were allegedly smuggled out of the country. This illegal trade is of concern to the Government. Plans called for MEM to form a new gold trading agency in 1995, which would attempt to increase the Government's share of revenue from gold production and trade. The Government's official gold statistics have ranged from 37 kilograms (kg) exported in 1992 to less than 1 kg in 1993, while actual production and illegal export may range from 500 kilograms per year (kgs/yr) to as much as 3,000 kgs/yr of gold. The Government is seeking cooperation from neighboring nations, such as Mauritius, to help interdict gold smuggling.

Madagascar imported essentially all of its crude petroleum and some petroleum products, which was a significant burden to the economy. In any given year, the value of petroleum imports was equivalent to 15% to 30% of the total foreign exchange earned from all export revenues.

The chromite industry, located in Andriamena, is controlled by the parastatal Société Kraomita Malagasy (KRAOMA). Graphite and mica production are owned and operated by foreign entities; but the Government had significant influence on these operations through taxes, royalties, and official approval of all foreign exchange transactions.

OMNIS, created in 1976, is involved primarily in research, joint ventures, and promotion of Madagascar's mineral resources, including hydrocarbons, and acts as the repository of the acquired exploration data. The MEM's primary responsibility is for the energy sector. The execution of the MEM's directives are carried out by the Directorate of Energy. MEM also directs SOLIMA and the Electricity and Water Co. The distribution, importation, and refining of petroleum products are managed by SOLIMA.

Chromite production from the Andriamena district, which began in 1967, has remained relatively stable in recent years. A minimum of 25 chromite lenses have been identified within the dunite host rocks of the Andriamena complex, and more lenses may yet be identified. Ore beneficiation enabled KRAOMA to produce a chromite concentrate grading from 48% to 50% chromium oxide (Cr_2O_3) with 0.002% to 0.003% phosphorus and lumpy chrome ore grading from 42% to 44% Cr_2O_3 according to a Government report. Typically, crude Malagasy chromite contained 0.007% phosphorus. KRAOMA reported that damage from the April 1994 typhoon had been repaired and that a new mine, Bemanevika, was being planned for start up in 1996. The Bemanevika Mine was reported to have reserves of 3 million metric (Mt) tons of chromite. Madagascar dropped slightly from 10 to 11 in the list of major world producers of chromite in 1995.

Madagascar has some scattered placer and lode gold deposits, and there reportedly existed a large black market for the mining and sale of gold. Gold mining is primarily artisanal and employed approximately 5,000 to 10,000 people.

Madagascar continus to be a producer and exporter of high-quality crystalline flake graphite. Exports of graphite in 1995, principally to the United Kingdom, the United States and Germany, were 15,561 tons, a 21% increase over 1994 exports.[3] Graphite is produced in Madagascar by five main companies, all headquartered in Antananarivo. Société Minière de la Grande Ile's (SMGI) Ambatomitamba graphite mine is the largest single producer. The other four operators are Etablissements Gallois, Société Louys, Etablissements Izouard, and Etablissements Rostaing. Three mines are operated by SMGI, with production of about 6,000 metric tons per year of graphite with a carbon content of 90% to 95%. A joint-venture partner or new owner is being sought by SMGI. SMGI is 100% owned by the French company Societe Participation Industrielle et Miniere which also owns Societe des Mines d'Ampandrandava's two phlogopite mica mines at Ampandrandava and Sakamasy.

There is an active, but largely uncontrolled, artisanal gemstone mining sector, with known but unreported production of emeralds, sapphires and other semiprecious stones. As with gold, proposed Government efforts to organize and regulate these small-scale mining activities had the potential to significantly increase formal export earnings and the Government tax base.

Madagascar is essentially entirely dependent on imports of crude petroleum to meet its energy needs. Total petroleum consumption averaged about 26 million barrels per year. During the past several years, there has been a modest amount of oil exploration by foreign companies in Madagascar. However, no significant commercial hydrocarbon finds have been reported. Established in 1966, the SOLIMA refinery at Tamatave had a total throughput refining capacity of 16,500 barrels per day utilizing imported crude.

Official estimates of chromite resources in Madagascar are 2.1 Mt of contained chromium, or less than 1% of the world total. Graphite reserves are estimated at more than 1 Mt. The Government stated that Madagascar has significant deposits of the rare earth mineral bastnasite and of bauxite, ilmenite, and iron ore. Deposits of coal, lignite, and uranium minerals also are known from the island. Discovered in the 1940's, total minable reserves of uranium-bearing minerals remains undetermined. Some small-scale mining of uranium-bearing minerals occurred but was subsequently abandoned. Copper-nickel deposits exist but are not considered economic.

Infrastructure development in Madagascar is inadequate for most mining development. Additional investment is needed to improve the road system and telecommunications network. The hydroelectric potential of Madagascar is estimated at 14,000 megawatts (MW) but remains underexploited. Current installed hydropower capacity is 106 MW. Petroleum loading and unloading facilities exists at Toamasina/Tamatave but are limited to oceangoing vessels of 50,000 deadweight tons. World Bank and International Monetary Fund economic stimulus programs have been implemented to accelerate the Government's liberalization and privatization efforts and to create the economic and legal environment needed to attract foreign investment in the mining, energy and other sectors. Increasingly strict environmental protection concerns such as those that resulted from titanium sands mining proposals, also may serve to inhibit new capital investment in the mining sector, at least in the short term.

[1]Where necessary, values have been converted from Madagascar francs (FMG) to U.S. dollars at the rate of FMG4265.6=US$1.00.

[2]Madagascar Oil Industry Profile. Mbendi Information Services (South Africa), Aug. 21, 1996. Internet address: http://mbendi.co.za.cymdoi.htm.

[3]Cooper, C. Graphite. Mining Journal (London), Metals and Minerals Annual Review-1996, p. 82.

Major Sources of Information

Ministry of Energy and Mines
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Office des Mines Nationales et des Industries Stratégiques (OMNIS)
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Telex: 261-2-223-70

Major Publications

Ministere des Finances et du Plan, Direction de L'Institut National de la Statistique et de la Recherche Economique: Bulletin Mensuel de Statistique, monthly.

TABLE 1
MADAGASCAR: PRODUCTION OF MINERAL COMMODITIES 1/

(Kilograms unless otherwise specified)

Commodity 2/		1991	1992	1993	1994	1995 e/
METALS						
Beryllium: Beryl in quartz concentrates, industrial and ornamental e/		3,000	3,000	3,000	3,000	3,000
Chromium:						
Chromite concentrate, gross weight	metric tons	56,000	69,123	60,900 r/	42,700 r/	41,000
Chromite ore, lumpy	do.	94,000	91,700 r/	83,300 r/	47,500 r/	62,000
Total	do.	150,000	160,700	144,200	90,200 r/	103,000
Gold, mine output, Au content e/ 3/		500 r/	500 r/	500 r/	500 r/	500
Rare-earth minerals: e/						
Bastnasite (60% REO)	metric tons	5	5	5	5	5
Monazite (55% REO)		100	100	100	100	100
INDUSTRIAL MINERALS						
Abrasives, natural: (industrial only) e/		10,000	10,000	10,000	10,000	10,000
Cement, hydraulic e/	metric tons	60,000	60,000	60,000	60,000	60,000
Clay, kaolin	do.	496	756	700 e/	700 e/	700
Feldspar e/		4,000	4,000	4,000	4,000	4,000
Gemstones: 4/						
Amazonite e/		2,000	2,000	2,000	2,000	2,000
Amethyst: e/						
Gem		1,700	1,700	1,700	1,700	1,700
Geodes		80	80	80	80	80
Graphite, all grades , shipments	metric tons	14,079	8,910	11,200 r/	12,715 r/	15,561 5/
Mica, phlogopite:						
Block	do.	90	4	4 e/	4 e/	4
Scrap	do.	500	716	700 e/	700 e/	700
Splittings and sheet	do.	90	78	70 e/	70 e/	70
Total	do.	680	798	774 e/	774 e/	774
Ornamental stones: 6/						
Jasper		11,694	68,300	68,000 e/	68,000 e/	68,000
Labradorite		35,010	61,654	61,000 e/	61,000 e/	61,000
Quartz: 7/						
Crystal e/		32,000	32,000	32,000	32,000	32,000
Piezoelectric		66,200	66,000	66,000 e/	66,000 e/	66,000
Rose quartz		4,802	27,666	27,000 e/	27,000 e/	27,000
Smelting e/		180,000	180,000	180,000	180,000	180,000
Salt, marine e/	metric tons	30,000	30,000	30,000	30,000	30,000
Stone: e/						
Calcite, industrial	do.	2,000	2,000	2,000	2,000	2,000
Dimension stone	do.	3,000	3,000	3,000	3,000	3,000
Marble, cipoline	do.	1	1	1	1	1
MINERAL FUELS AND RELATED MATERIALS						
Petroleum refinery products:						
Distillate fuel oil	thousand 42-gallon barrels	922	900 e/	900 e/	225 r/	450
Gasoline	do.	434	400 e/	400 e/	100 r/	200
Kerosene and jet fuel	do.	291	290 e/	290 e/	70 r/	140
Residual fuel oil	do.	500	500 e/	500 e/	125 r/	250
Other	do.	20	20 e/	20 e/	5 r/	10
Total	do.	2,167	2,110 e/	2,110 e/	525 r/	1,050

e/ Estimated. r/ Revised

1/ Table includes data available through Aug. 1996.

2/ In addition to the commodities listed, modest quantitites of unlisted varieties of crude construction materials (other clays, sand and gravel, and other stone) presumably are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

3/ Does not include an estimate of smuggled artisanal production.

4/ Estimated output of other gemstones in kilograms: Citrine 6; Cordierite 7; Garnet 300; and Tourmaline 300.

5/ Reported figure.

6/ Other ornamental stones produced for which data is uncertain include: Agate, Apatite, Aragonite, Calcite, and Celestite.

7/ Other forms of quartz mined historically and estimated production in kilograms: Geodes 2,500; Hematoid 300; and other ornamental quartz 3,000.