



2008 Minerals Yearbook

MADAGASCAR

THE MINERAL INDUSTRY OF MADAGASCAR

By Thomas R. Yager

Madagascar played a significant role in the world's production of gemstones in early 2008. The country was one of the world's top-ranked sapphire producers. Starting in March 2008, gemstone production decreased precipitously because of the Government's ban on rough gemstone exports. Gemstone production decreased in other countries because of the worldwide economic crisis in late 2008; Madagascar's significance to the world gemstone industry was unclear at yearend. Other domestically significant minerals produced included chromite and ornamental stones. Madagascar was not a globally significant consumer of minerals in 2008.

Minerals in the National Economy

In 2008, the manufacturing sector accounted for an estimated 13.2% of the gross domestic product, and the mining and construction materials sector accounted for 0.7%. In early 2008, an estimated 50,000 miners were working at the Ilakaka sapphire mines; employment in the mining industry probably declined sharply later in the year (Ministry of the Economy, Commerce, and Industry, 2008, p. 114; Cartier, 2009).

Production

In 2008, cement production increased by an estimated 70%; gold, by an estimated 44%; and limestone, by an estimated 14%. Emerald production decreased by an estimated 96% in 2008; ruby and sapphire, by an estimated 82% each; quartz, by 46%; and chromite, by 31%. The country began producing crude petroleum, ilmenite, rutile, and zircon in 2008. The country's petroleum refinery was shut down in 2005. Data on mineral production are in table 1.

Structure of the Mineral Industry

Most of Madagascar's mining and mineral processing operations were privately owned, including the gemstone, graphite, and salt mines and the cement plant. Artisanal miners produced gemstones and gold. State-owned Kraomita Malagasy SA (KRAOMA) was the country's only chromite producer. Table 2 lists major mineral industry facilities in Madagascar.

Commodity Review

Metals

Bauxite and Alumina.—In November 2006, Alcan Inc. of Canada signed a joint-venture agreement with Access Madagascar Sarl, which held the mineral rights for the Manantenina bauxite deposit in southeastern Madagascar. The companies planned to complete a concept study of the development of an alumina refinery with an initial capacity of 1.5 million metric tons per year (Mt/yr) and of a bauxite mine.

The capacity of the alumina refinery could increase to 3 Mt/yr in the second phase of the project. Rio Tinto Group purchased Alcan in 2007 (Ranjatoelina, 2008).

Chromium.—KRAOMA produced chromite concentrates and lumpy ore from the Bemanevika Mine, which was estimated to have a remaining life of 15 years. The Ankazotaolana Mine was shut down in 2007 after its reserves were depleted. In 2008, KRAOMA's chromite production amounted to 84,000 metric tons (t) compared with a revised 122,260 t in 2007. KRAOMA shut down mining operations at Bemanevika in October 2008 (Ranjatoelina, 2008; Rahaga, 2009).

Cobalt and Nickel.—Starting in 2010, a joint venture of Sherritt International Corp. of Canada (40%), Sumitomo Corp. of Japan (27.5%), Korea Resources Corp. of the Republic of Korea (27.5%), and SNC-Lavalin Inc. of Canada (5%) planned to mine two nickel-cobalt deposits at Ambatovy. Lateritic slurry from the Ambatovy ore-processing plant was to be processed at a pressure-acid-leaching plant at Toamasina. The plant was expected to produce a sulfide product that contained 55.2% nickel and 4.2% cobalt. The sulfide product would be processed at a refinery with a capacity of 60,000 metric tons per year (t/yr) of refined nickel and 5,600 t/yr of cobalt; the mine was expected to start production in 2010 and to reach full production in 2012. Capital costs of the mine, pipeline, processing plants, refinery, power supply, and port facilities were estimated to be \$3.3 billion. The life of the project was estimated to be 27 years (Mining Journal, 2005; Ranjatoelina, 2008).

Diamond Fields International Ltd. (DFI) of Canada purchased the exploration rights for the Valozoro nickel laterite deposit in south-central Madagascar. Previous estimates of resources at Valozoro amounted to 3.6 million metric tons at a grade of 1.75% nickel. DFI planned to provide an updated resource estimate by the end of February 2009. In the second quarter of 2008, NGM Resources Ltd. of Australia engaged in stream sediment sampling at Ambolotarabe, Londokomanana, and Maralambo (NGM Resources Ltd., 2008; Diamond Fields International Ltd., 2009).

Copper and Platinum-Group Metals.—Jubilee Platinum plc of the United Kingdom explored at its Ranomena nickel-copper-platinum group metals prospect in 2008. Malagasy Minerals Ltd. (MML) of Australia conducted sampling programs at the Ampanihy nickel-copper and the Vohibory copper-silver properties in 2008; the company planned to drill at Ampanihy and Vohibory in the first half of 2009 (NGM Resources Ltd., 2008; Pascoe, 2009).

Gold.—In 2008, Ara Minerals of Israel and KRAOMA were awarded the right to develop the Betsiaka gold deposit in northern Madagascar. Ara planned to invest \$26.6 million in exploration during a period of 2 years; the company planned to commence a drilling program in 2009 (Ranjatoelina, 2009).

Pencari Mining Corp. of Canada started drilling at Itea in central Madagascar in March; the company also held the East Fianar, the Ejeda, the P49, and the Tsididy properties.

Majescor Resources Inc. of Canada explored for gold; Sunridge Gold Corp. of Canada acquired Majescor's properties in October. Uranium Star Corp. of Canada engaged in stream sediment sampling at Ianapera. Golden Deeps Ltd. of Australia decided to relinquish its Kelimaizina property in north-central Madagascar in 2008 (Saywell, 2008; Ranjatoelina, 2009; Uranium Star Corp., 2009, p. 9).

Titanium and Zirconium.—QIT Madagascar Minerals SA [QIT Fer et Titane of Canada (a subsidiary of Rio Tinto plc), 80%, and the Government of Madagascar, 20%] started production of ilmenite, rutile, and zircon at Mandena in southeastern Madagascar at the end of December 2008. The company planned to produce 750,000 t/yr of ilmenite, 25,000 t/yr of zircon, and 15,000 t/yr of rutile. The ilmenite had a grade of 60% titanium dioxide (TiO₂). Shipments of ilmenite to Canada for smelting were expected to start by March 2009. Production could increase to 2 Mt/yr of ilmenite starting in 2012. The life of the mine was estimated to be 40 years (Kotze, 2008; Industrial Minerals, 2009).

At the end of 2008, Exxaro Resources Ltd. of South Africa and Madagascar Resources NL of Australia were engaged in a feasibility study of mining the Ranobe mineral sands deposit. The companies continued pilot processing that started in 2007. Depending upon the results of the study, a new mine could be built with a capacity of 560,000 t/yr of ilmenite at a grade of 50% TiO₂, 140,000 t/yr of ilmenite at a grade of 58% TiO₂, 44,000 t/yr of zircon, and 10,000 t/yr of rutile. The life of the mine was expected to be about 25 years. Capital costs were projected to be \$250 million (Ranjatoelina, 2008, 2009).

Vanadium.—Uranium Star explored for gold at its Three Horses property; the company started a drilling program in October 2008. Vanadium mineralization was discovered at Three Horses in the fourth quarter of 2008. Uranium Star planned further exploration for vanadium in 2009; the planned exploration budget for the company's properties in 2008 and 2009 was \$3.1 million (Uranium Star Corp., 2009, p. 8-10).

Industrial Minerals

Cement and Stone, Crushed.—Holcim (Madagascar) S.A. had cement plants at Ibity and Toamasina. In 2008, Holcim was producing cement at Ibity at an annual rate of 150,000 t/yr. The company planned to replace the Ibity plant with a new plant in early 2011. The new plant was expected to have a capacity of 800,000 t/yr and to cost \$200 million (Madagascar Tribune, 2008; Rakotomalala, 2008a).

In June 2008, Madagascar Long Cimenterie (Maloci) of China completed a new cement plant at Ambohimanambola with a capacity of 300,000 t/yr. Maloci initially produced cement from imported clinker; the company planned to build a clinker plant that would use local gypsum and limestone as raw materials. Maloci planned to open a limestone quarry at Antsirabe. Local cement prices decreased because of the opening of Maloci's new plant (Rakotomalala, 2008b).

In 2007, domestic cement consumption was 430,000 t compared with 380,000 t in 2006; Holcim's market share was estimated to be 63%. Madagascar's cement demand was expected to double by 2018 because of growth in the

construction sector. Cement was imported from China (Rakotomalala, 2008a).

Gemstones.—Madagascar was one of the world's leading producers of sapphire; most domestically mined sapphire was produced by artisanal miners at Ilakaka, Manombe, and Sakara in the south-central part of the country. From 2005 to 2007, reported sapphire exports increased to 5,124 kilograms (kg) from 4,361 kg; the increase may be attributable to the discovery of new sapphire deposits at Marosely, which is located south of Ranotsara. Sapphire was also produced at Ambondromifehy in northern Madagascar (Pezzotta, 2006; Ministry of the Economy, Commerce, and Industry, 2008, p. 53; Cartier, 2009).

Tsavorite, which is a green grossular garnet that obtains its color from trace amounts of chromium and vanadium, and vanadium-rich color-change garnet were produced at Behara in southern Madagascar. In August 2008, about 300 miners and gemstone traders were working at Behara (Pardieu and Hughes, 2009).

Norcross Madagascar Group of the United States started mining gem-, cabochon-, and ornamental-grade amethyst near Ambatonrazaka in March 2008. Seasonal rains from December 2007 to February 2008 prevented mining from starting earlier (Norcross Madagascar Group, undated).

Emerald was mined near Mananjary in eastern Madagascar. From 2005 to 2007, reported exports of emerald increased to 137 kg from 22 kg. In July 2007, Societe Orgaco of France mined the 536-kg Heaven's Gift Emerald in matrix at the Morafeno Mine near Mananjary and exported it to Reunion later in the year. The Government asserted that the emerald was exported illegally and sued Orgaco in Reunion. In June 2008, the court ruled that Orgaco had exported the emerald legally (Ministry of the Economy, Commerce, and Industry, 2008, p. 53; Jarrett, 2009).

The Government instituted a ban on the export of rough gemstones at the end of February 2008 in response to the export of the Heaven's Gift Emerald; the ban was still in effect at yearend. Madagascar's lapidary industry reportedly had the capacity to cut and polish about 2% of domestic rough gemstone production. Many foreign gemstone dealers left the country and gemstone mining declined sharply after the ban was implemented (Jarrett, 2009).

A wide variety of ornamental stones, which included agate, amazonite, ammolite, aragonite, calcite, cornaline, jasper, labradorite, and quartz was also produced in Madagascar. National exports of ornamental stones increased to 8,495 t in 2007 from 1,599 t in 1997. The increase was primarily attributable to increased production of labradorite (National Institute of Statistics, 2000, p. 12; Ministry of the Economy, Commerce, and Industry, 2008, p. 53).

EUROMAD SA of Italy and Marbres et Granits de Madagascar SARL (MAGRAMA) of Italy had royalty agreements with MML to mine labradorite from the anorthosite intrusives at Ianapera and Maniry. The companies produced about 3,000 t/yr of labradorite. SQNY International of India also planned to mine labradorite at Ianapera and Maniry under a royalty agreement with MML. Total production by EUROMAD, MAGRAMA, and SQNY was expected to increase to 10,000 t/yr of labradorite after 2008. Norcross also mined labradorite near Maniry (Malagasy Minerals Ltd., 2008, p. 8-9).

In 2007, Norcross mined agate, amazonite, calcite, jasper, and quartz. The company opened new mines that included a blue calcite mine near Antsirabe, a hematoid quartz mine near Tsiroanomandidy, and a rhodonite mine near Ampanihy in 2008. Norcross also discovered new blue quartz and rose quartz deposits in 2008 (Norcross Madagascar Group, undated).

Mineral Fuels and Related Materials

Coal.—MML engaged in drilling at Ianapera near the Sakoa coal deposit in 2008; the company planned additional drilling for 2009. In November, Uranio Ltd. of Australia purchased the Imaloto project from Coal of Africa Ltd. of South Africa. Uranio planned to commence drilling at Imaloto in 2009. Straits Resources Ltd. of Australia was considering the development of a mine at Sakoa in southern Madagascar that could produce between 3 and 5 Mt/yr (Pascoe, 2009; Piper, 2009; Ranjatoelina, 2009).

Petroleum.—At the onshore Tsimiroro block, Madagascar Oil Ltd. of the United States ran a pilot plant using steam injection to recover heavy petroleum. Production started in March 2008; Madagascar Oil planned a second phase of pilot production to increase petroleum recovery to 60% from 15%. At the start of October, the company announced that crude petroleum in place at Tsimiroro amounted to about 1.3 billion barrels (Gbb). In September, Madagascar Oil signed a farmout agreement with Total SA of France for the Bemolanga tar sands project. The companies were considering the development of a mine at Bemolanga to produce 180,000 barrels per day for more than 30 years. Resources at Bemolanga were estimated to be 16 Gbb of crude petroleum (Madagascar Oil Ltd., 2008; Pascoe, 2009).

Uranium.—UMC Energy plc of the United Kingdom planned to engage in surface sampling at Folakara in the second half of 2008; the company postponed plans to drill until 2009. In March 2008, Pencari held eight uranium properties in central and southern Madagascar (Saywell, 2008; UMC Energy plc, 2008).

Outlook

Madagascar's mineral industry is likely to grow significantly because of increased cement, ilmenite, labradorite, rutile, and zircon production in 2009, and the startup of cobalt and nickel production in 2010. Crushed stone and gypsum production is also likely to increase as Maloci shifts from imported to domestic clinker. Further growth in the mineral industry could result from the development of the Ranobe mineral sands deposit and the Beamlonga and the Tsimiroro petroleum projects. Gemstone production is unlikely to increase under current legislation without an increase in domestic lapidaries and the trained workers to support them.

References Cited

- Cartier, L.E., 2009, Livelihoods and production cycles in the Malagasy artisanal ruby-sapphire trade—A critical examination: *Resources Policy*, v. 34, no. 1-2, March-June, p. 80-86.
- Diamond Fields International Ltd., 2009, Second quarter report for the period ended December 31, 2008: Vancouver, British Columbia, Canada, Diamond Fields International Ltd., unpaginated.
- Industrial Minerals, 2009, Rio Madagascar to be shipping by March: *Industrial Minerals*, no. 496, January, p. 22.
- Jarrett, Diana, 2009, Madagascar mess: *Rapaport Diamond Report*, v. 32, no. 1, January, p. 172-173.
- Kotze, Cobus, 2008, QMM ilmenite project—More than just the sands: *African Mining*, v. 13, no. 5, September/October, p. 51-58.
- Madagascar Oil Ltd., 2008, Madagascar Oil hits another milestone: Houston, Texas, Madagascar Oil Ltd. press release, October 1, 2 p.
- Madagascar Tribune, 2008, Voyage presse Holcim: *Madagascar Tribune* [Antananarivo, Madagascar], June 5, unpaginated.
- Malagasy Minerals Ltd., 2008, Annual report 2008: West Perth, Australia, Malagasy Minerals Ltd., 61 p.
- Mining Journal, 2005, Dynatec outlines major Malagasy project: *Mining Journal*, March 4, p. 7.
- Ministry of the Economy, Commerce, and Industry, 2008, Rapport économique et financier 2007-2008: Antananarivo, Madagascar, Ministry of the Economy, Commerce, and Industry, 123 p.
- National Institute of Statistics, 2000, Journée Africaine de la Statistique 1999—Les points saillants: Antananarivo, Madagascar, National Institute of Statistics, 42 p.
- NGM Resources Ltd., 2008, Quarterly report 30 June 2008: South Perth, Australia, NGM Resources Ltd., 6 p.
- Norcross Madagascar Group, [undated], Press releases: Norcross Madagascar Group. (Accessed October 22, 2009, at http://www.madagascarminerals.com/press_releases.cfm).
- Pardieu, Vincent, and Hughes, R.W., 2009, Tsavorite—The untamed beauty: *InColor*, no. 9, Fall/Winter, p. 12-19.
- Pascoe, Andrew, 2009, Madagascar still in the picture: *Australia's Paydirt*, v. 1, no. 157, December/January, p. 38.
- Pezzota, Frederico, 2006, New gem localities in Madagascar: *Gems & Gemology*, v. 42, no. 3, Fall, p. 116.
- Piper, Dominic, 2009, Madagascar story gives Uranio cash and ground: *Australia's Paydirt*, v. 1, no. 157, December/January, p. 59.
- Rahaga, Jean Luc, 2009, Kraomita Malagasy—Reprise de la production: *La Verite* [Antananarivo, Madagascar], May 25, unpaginated.
- Rakotomalala, Mahefa, 2008a, Holcim remplacera sa cimenterie a Ibyty: *L'Express de Madagascar* [Antananarivo, Madagascar], June 5, unpaginated.
- Rakotomalala, Mahefa, 2008b, Le ciment chinois casse les prix: *L'Express de Madagascar* [Antananarivo, Madagascar], June 24, unpaginated.
- Ranjatoelina, Willy, 2008, Dynamic Madagascar mining brings investment: *Mining Journal*, April 18, p. 16-19.
- Ranjatoelina, Willy, 2009, Madagascar's drum beats loud across African seas: *Mining Journal*, May 1, p. 22-27.
- Saywell, Trish, 2008, Pencari quietly builds Madagascar holdings: *The Northern Miner*, v. 94, no. 5, March 24-30, p. 1, 13.
- UMC Energy plc, 2008, Interim financial results for the six months ending 30 June 2008: London, United Kingdom, UMC Energy plc, unpaginated.
- Uranium Star Corp., 2009, Form 10-Q—For the quarterly period ended December 31, 2008: Toronto, Ontario, Canada, Uranium Star Corp., 33 p.

TABLE 1
MADAGASCAR: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2004	2005	2006 ^e	2007	2008 ^e
METALS					
Beryllium, beryl in quartz concentrates ^c	12,000 ^{r,3}	12,000 ^r	12,000 ^r	12,000 ^r	12,000
Chromium, marketable output:					
Chromite concentrate, gross weight ^e	21,000	36,000	32,000	30,000	21,000
Chromite ore, lumpy ^e	56,000	105,000	100,000	92,000 ^r	73,000
Total	77,386	140,847	132,335 ³	122,260 ^r	84,000 ³
Gold, mine output, Au content ^{e,4}	-- ^{r,3}	10 ^r	30 ^r	50 ^r	72 ³
INDUSTRIAL MINERALS					
Cement, hydraulic ^c	170,000	150,000	150,000	270,000 ³	460,000
Clay, kaolin	NA ^r	NA ^r	NA ^r	NA ^r	NA
Gemstones: ^{e,5}					
Amethyst ⁶	620	620	620	620	620
Cordierite	160	160	160	160	160
Emerald	53 ^{3,7}	22 ^{r,3,7}	70 ^r	672 ^{r,3,7}	25
Garnet	600	600	600	600	600
Ruby	741 ^{3,7}	840 ^{r,3,7}	400 ^r	78 ^{r,3,7}	14
Sapphire	5,890 ^{3,7}	4,361 ^{r,3,7}	4,700	5,124 ^{r,3,7}	940
Tourmaline ⁶	64,000	68,000	68,000	68,000	68,000
Graphite, all grades	7,770	6,400	4,857 ^{r,3}	5,000 ^{r,e}	5,000
Gypsum ^c	500	500	500	500	500
Mica, phlogopite	287 ^{r,7}	546 ^{r,7}	1,071 ^{r,3,7}	1,349 ^{r,7}	1,233 ^{3,7}
Ornamental stones: ^{e,5}					
Agate	25,000	25,000	25,000	25,000	25,000
Labradorite	4,200 ^r	4,200 ^r	4,200 ^r	4,200 ^r	4,200
Quartz	436 ^{r,3,7}	141 ^{r,3,7}	1,643 ^{r,3,7}	1,596 ^{r,3,7}	867 ^{3,7}
Salt, marine ^{e,8}	55,000	65,000	75,000	75,000	75,000
Stone: ^e					
Dimension	NA ^r	NA ^r	NA ^r	NA ^r	NA
Limestone ⁹	220,000 ^r	190,000 ^r	190,000 ^r	350,000 ^r	400,000
Marble	5,000	5,000	5,000	5,000	5,000
Titanium:					
Ilmenite concentrate	--	--	-- ³	--	10,000
Rutile concentrate	--	--	-- ³	--	200
Zirconium concentrate	--	--	-- ³	--	350
MINERAL FUELS AND RELATED MATERIALS					
Petroleum:					
Crude	--	--	-- ³	--	14
Refinery products:					
Gasoline	964 ^r	1,211 ^r	-- ³	--	-- ³
Kerosene and jet fuel	526 ^r	373 ^r	-- ³	--	-- ³
Distillate fuel oil	426 ^r	463 ^r	-- ³	--	-- ³
Residual fuel oil	547 ^r	677 ^r	-- ³	--	-- ³
Liquified petroleum gas	73 ^r	50 ^r	-- ³	--	-- ³
Other	140 ^r	161 ^r	-- ³	--	-- ³
Total	2,676 ^r	2,935 ^r	-- ³	--	-- ³

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through March 10, 2010.

²In addition to the commodities listed, modest quantities of crude construction materials (other clays, sand and gravel, and stone), industrial abrasives and calcite, and kaolin presumably are produced, but available information is inadequate to make reliable estimates of output.

³Reported figure.

⁴Does not include smuggled artisanal production, which is estimated to be from 1,000 to 2,000 kilograms per year.

⁵Does not include smuggled artisanal production.

⁶Includes both gem and ornamental quality.

⁷Reported exports.

⁸Compagnie Salinere de Madagascar and Grand Salines de Menabe only. Other companies reportedly produced small amounts of salt.

⁹Cement producers only.

TABLE 2
MADAGASCAR: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Holcim (Madagascar) S.A. (Holcim Group, 90%)	Plant at Toamasina	230,000.
Do.		do.	Plant at Iby	220,000.
Do.		Madagascar Long Cimenterie (Maloci)	Plant at Ambohimanambola	300,000.
Do.		SA Nouvelle Cimenterie Amboanio (LaFarge Group, 66%, and Moustansir Ibaramdy Family, 34%)	Plant at Mahajanga ¹	50,000. ^c
Chromium		Kraomita Malagasy SA (Government, 100%)	Mine at Ankazotaolana ¹	250,000.
Do.		do.	Mine at Bemanevika ¹	200,000. ^c
Gemstones:				
Rough:				
Amethyst	kilograms	Norcross Madagascar Group	Mines at Ambatonrazaka	NA.
Emerald	do.	Artisanal and small-scale miners	Mines at Mananjary	130. ^c
Labradorite		Marbres et Granits de Madagascar SARL	Mines at Ianapera and Maniry	4,200. ^c
Do.		EUROMAD SA	do.	NA.
Do.		Norcross Madagascar Group	Mines at Maniry	1,200. ^c
Quartz		do.	Mines at Ramaratina	NA.
Ruby	kilograms	Artisanal and small-scale miners	Mines at Andilamena and Vatondry	1,000. ^c
Sapphire	do.	Various producers, including the following: Artisanal and small-scale miners World Sapphire Group Tany Hafa S.A. Canalta Gems Inc.	Locations: Mines at Ilakaka, Manombe, Marosely, and Sakara Mines at Ilakaka Mines at Sahambano Mines at Nose-Be and Andovokonko	5,000. ^c
Tourmaline	do.	Artisanal and small-scale miners	Mines at Alatsinainuy Iby	NA.
Polished ²	do.	Dream Stones Trading	Plant in Antananarivo	15.
Graphite		Etablissements Gallois	Artsirakambo Mine near Brickaville	4,800.
Do.		do.	Marovinsty Mine near Vatondry	3,600.
Do.		do.	Ambalafotaka Mine	NA.
Do.		Société Minière de la Grande Ile (Graphite Technology Group Inc., 50%)	Ambatomitamba Mine near Tamatave	6,000.
Do.		do.	Ambiani, Ambodihaina, Sandraka, and Sahamaloto Mines	3,600.
Do.		Société Arsène Louys	Mine at Ambatoharanana	3,000. ^c
Do.		Etablissements Izouard	Faliarno Mine near Moramanga	2,000.
Gypsum		Compagnie Salinere de Madagascar	Antsahampano	500.
Mica		Societe des Mines d'Ampandranhava	Tolagnaro	2,000 processed.
Petroleum, crude	thousand 42-gallon barrels	Madagascar Oil Ltd.	Tsimiroro	17. ^c
Salt		Compagnie Salinere de Madagascar	Antsahampano	70,000.
Do.		Grand Salines du Menabe	Morondava	5,000. ^c

^cEstimated. Do., do. Ditto. NA Not available.

¹Not operating at the end of 2008.

²Includes amethyst, aquamarine, emerald, sapphire, tourmaline, and other gemstones.

