



2012 Minerals Yearbook

SIERRA LEONE

THE MINERAL INDUSTRY OF SIERRA LEONE

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Sierra Leone's real gross domestic product (GDP) in 2012 grew by an estimated 15.2%, driven mostly by an upsurge in iron ore production. The mineral sector accounted for about 71% of total export revenues in 2012 (mainly from exports of diamond, iron ore, and rutile concentrate), and it employed about 3% of the total workforce. Agriculture, however, remained the mainstay of the economy, accounting for about 42% of the GDP and employing about 70% of the country's total workforce. Sierra Leone ranked among the world's top 10 producers of diamond and rutile by volume. Other commodities produced included bauxite, cement, gold, and ilmenite and zirconium concentrates. Prospective minerals included petroleum, natural gas, and rare-earth minerals. Sierra Leone was open to foreign direct investment and adhered to global standards for transparency, which included participation in the Extractive Industries Transparency Initiative (EITI) and the Kimberly Process Certification Scheme (Bank of Sierra Leone, 2013, p. 1–3; Bedinger, 2013; International Monetary Fund, 2013, p. 8; Kimberly Process Rough Diamond Statistics, 2013).

Government Policies and Programs

The Ministry of Mines and Mineral Resources of Sierra Leone (MMR) is the Government agency responsible for the administration of the mining sector, which is regulated by the Mines and Minerals Act of 2009. Under this law, all rights of ownership in and control of minerals in Sierra Leone are vested in the state. Petroleum exploration and production is regulated by the Petroleum (Exploration and Production) Act (2011). The Petroleum Directorate is the Government agency tasked with monitoring all petroleum operations in the country, including assisting in the assessment of prospective investors in the sector, participating in the bidding process, assessing royalties and bonuses owed to the Government, and ensuring the establishment of a central database for petroleum-related activities, among other tasks. The Sierra Leone National Petroleum Company is responsible for the management on behalf of the Government of all commercial aspects of petroleum operations in the country (Ministry of Mines and Mineral Resources of Sierra Leone, 2010; Sierra Leone Web, 2013b).

In January 2012, the Government launched an online mining database to provide public access to information regarding the granting of mining licenses. The database provides the status of mining licenses, the geo-referenced location of concession areas, and information on paid and outstanding mining fees and on ownership of exploration and mining rights. On March 29, the Sierra Leone Parliament enacted the National Minerals Agency Act, which created the National Minerals Agency (NMA). The NMA is tasked with implementing the mining policies devised by the MMR (Sierra Leone Web, 2013a; Natural Resource Charter, undated).

Production

Sierra Leone's output levels for bauxite, gold, and zirconium concentrate decreased during the year by 40%, 18%, and 93%, respectively. Production increased for all other mineral commodities, however, including iron ore, diamond, ilmenite concentrate, rutile concentrate, and cement, which increased by 408%, 52%, 42%, 39%, and 8%, respectively. The significant increase in iron ore output was mainly a result of the rampup of production at the Marampa and the Tonkolili iron ore mines. Data on mineral production are in table 1.

Structure of the Mineral Industry

Most of Sierra Leone's mining and mineral processing operations were privately owned. Table 2 is a list of major mineral industry facilities.

Mineral Trade

Sierra Leone's total merchandise trade (exports plus imports) was valued at \$2.7 billion in 2012. Total export receipts from diamond, iron ore, and rutile concentrate exports amounted to \$1.1 billion. Export revenues from the mineral sector accounted for 70.67% of total export receipts. Sierra Leone's total exports to the United States were valued at about \$17.8 million compared with about \$26.6 million in 2011; \$2.9 million of these exports were rough diamond. Imports from the United States were valued at about \$100.9 million in 2012 compared with \$102.8 million in 2011; these included \$5.3 million in excavating machinery, \$296,000 in petroleum products; \$61,000 in iron and steel products, and \$53,000 in drilling and oilfield equipment. Sierra Leone was an active member of the Economic Community of West African States (Bank of Sierra Leone, 2013, p. 22–24; U.S. Census Bureau, 2013a, b).

Commodity Review

Metals

Bauxite and Alumina.—Netherlands-based Vimetco N.V.'s vertically integrated bauxite mining operation in Sierra Leone produced a total of 776,000 metric tons (t) compared with a revised 1.3 million metric tons (Mt) in 2011. The decrease in production was attributed to adverse weather conditions that affected the operation of mining equipment. Vimetco operated the mine through its subsidiary Sierra Mineral Holdings 1 Ltd. All the bauxite produced was shipped to Romania and processed into alumina at Vimetco's alumina refinery in Tulcea and then into aluminum at the company's aluminum smelter in Slatina. In 2012, Vimetco's bauxite mining license in Sierra Leone was extended for a period of 20 years. The company's estimated

bauxite reserves were reported to be about 31 Mt (Vimetco N.V., 2013a, p. 7–8, 10; 2013b).

Gold.—In November 2012, London-based Amara Mining plc (formerly Cluff Gold plc; the name was changed on October 1, 2012) completed an updated resource estimate study for its Baomahun gold project, which is located about 180 kilometers (km) east of the capital city of Freetown in Southern Province. Indicated mineral resources at Baomahun were updated to 38.4 Mt at an average grade of 1.82 grams per metric ton (g/t) gold, and inferred mineral resources were updated to 6.6 Mt at an average grade of 2.52 g/t gold. A definitive feasibility study for Baomahun was expected to be completed by the second half of 2013 and the mine to be operational by the second half of 2015, depending on the results of the study. Baomahun would be developed as an open pit mine with a conventional carbon-in-leach processing plant. The mine was expected to produce more than 4,000 kilograms per year of gold and to have an estimated life of 8 years (Amara Mining plc, 2013, p. 21–22).

Also in November, Polo Resources Ltd. of South Africa, through its subsidiary Nimini Mining Ltd., was granted a 25-year mining license for the development of the Komahun gold project. A resource estimate conducted by SGS Canada Inc. and published by Polo Resources in August 2012 yielded indicated resources for Komahun of 3.5 Mt at an average grade of 4.59 g/t gold and inferred resources of 2.2 Mt at an average grade of 3.64 g/t gold. Polo planned to complete a prefeasibility study for Komahun during the second quarter of 2013 (Polo Resources Ltd., 2012a, p. 10; 2012b; SGS Canada Inc., 2012, p. 10).

Iron Ore.—The Marampa Mine, which was operated by London Mining plc of the United Kingdom, produced more than 1.5 Mt of high-quality iron ore sinter concentrate in 2012. Production was from the mining of highly weathered primary ore and from tailings. The Marampa Mine had operated from 1935 to 1975 and then again from 1982 to 1985 but was closed in 1985 owing to a decrease in the global price of iron ore and an increase in operating costs. The mine remained closed until 2009 as a result of Sierra Leone's civil war, and it was eventually reopened in 2011. London Mining planned to expand the mine's production capacity to 5 million metric tons per year (Mt/yr) of sinter concentrates by the end of 2013 by mining highly weathered primary ore and also tailings from the mine's previous operation. The commissioning of a second processing plant was expected to increase the mine's production capacity to at least 3.3 Mt/yr by 2013. A bankable feasibility study completed in November considered further expanding the plant's processing capacity to 9 Mt/yr. As of December 2012, Marampa's indicated mineral resources were estimated to be 829 Mt at an average grade of 31.7% iron and the mine's inferred mineral resources to be 208 Mt at an average grade of 30.6% iron. Total mineral resources at Marampa, including tailings, were estimated to be 1.07 billion metric tons (Gt) at a grade of 31.2% iron (London Mining plc, 2013, p. 24–28).

The Tonkolili Mine produced a total of 5.1 Mt of iron ore in 2012 and was expected to reach a processing plant run rate of 20 Mt/yr by 2013 from its current installed capacity of 10 Mt/yr. Tonkolili's total resources were estimated to be 12.8 Gt of

measured, indicated, and inferred resources, which included 126.6 Mt of direct-shipping hematite lump ore at an average grade of 59.1% iron, 11.5 Gt of magnetite at an average grade of 30.1% iron, and 1.1 Gt of saprolite at an average grade of 40% iron (African Minerals Ltd., 2013, p. 2; undated).

Titanium and Zirconium.—The Sierra Rutile Mine, which was operated by Sierra Rutile Ltd., was the country's sole producer of ilmenite, rutile, and zirconium concentrates. The Sierra Rutile Mine is located in southwestern Sierra Leone near the Imperri Hills, about 30 km from the Atlantic Ocean and 130 km from Freetown. In 2012, the mine produced a total of 94,493 t of rutile concentrate, 22,590 t of ilmenite concentrate, and 610 t of zirconium concentrate. A dry mining plant that was commissioned during the fourth quarter of 2012 was expected to add between 30,000 and 35,000 metric tons per year (t/yr) of rutile concentrate and between 6,000 and 9,000 t/yr of ilmenite concentrate to the output capacity of the Sierra Rutile Mine. The new dry plant would be able to produce high-grade titanium minerals, which were reportedly inaccessible by dredge mining (Sierra Rutile Ltd., 2012, p. 10–11).

A feasibility study for the construction of a second dry mining plant, which would have a capacity to produce an additional 83,000 t/yr of rutile concentrate, 46,000 t/yr of ilmenite concentrate, and 9,500 t/yr of zirconium concentrate, was expected to be completed during the second quarter of 2013. As of August 31, 2012, Joint Ore Reserves Committee (JORC)-compliant measured, indicated, and inferred resources for the mine were estimated to be more than 800 Mt. In October, the company also announced the completion of a scoping study for the Sembahun dredge mining project, which, if it is developed, could reportedly add 113,000 t/yr of rutile concentrate and 66,000 t/yr of ilmenite concentrate to Sierra Rutile's operation for a period of more than 20 years. The project would consist of a 1,875-metric-ton-per-hour (t/h) bucket ladder dredge and associated floating concentrator plant, a 50-t/h mineral separation plant, and an 18.6-megawatt powerplant. Sierra Rutile planned to carry out an exploration program and mineral resource evaluation in 2013 for other targets, including the Gbangbaia, the Jagbwema, and the Semabu deposits, which are adjacent to the Sierra Rutile Mine (Sierra Rutile Ltd., 2012, p. 11–14).

Industrial Minerals

Diamond.—Diamond in Sierra Leone was mined mainly from alluvial deposits at the Bo, the Kenema, and the Kono districts along the drainages of the Bafi, the Mano, the Moa, the Sewa, and the Woyie Rivers. In 2012, the Kimberley Process Certification Scheme reported total rough diamond production to be 541,166 carats, which represented a 52% increase from production in 2011. All diamond output was exported. The average value per carat of Sierra Leone's diamond decreased by about 13% to \$302 per carat but, despite this decrease, the gem-quality to industrial-quality ratio improved during the year to about 80% gem-quality and 20% industrial-quality diamond (Bank of Sierra Leone, 2013, p. 6; Kimberley Process Rough Diamond Statistics, 2013).

Mineral Fuels

Petroleum.—Sierra Leone did not produce or refine petroleum and was dependent upon imports to meet its domestic petroleum requirements. The discovery in 2007 of the Jubilee oilfield offshore Ghana triggered the interest of international petroleum companies in exploring offshore Sierra Leone along the West Africa transform margin (WATM). The WATM is a hydrocarbon province that stretches 1,500 km along the coasts of eastern Ghana, Côte d'Ivoire, Liberia, and Sierra Leone. Prior to 2012, at least nine companies explored for petroleum offshore, including African Petroleum Corp. Ltd. of Australia; the consortium of Anadarko Petroleum Corp. of the United States, Repsol YPF S.A. of Spain, and Tullow Oil of the United Kingdom; Lukoil Group of Russia; Oranto Petroleum Ltd. of Nigeria; Prontinal Ltd. of the United Kingdom; Talisman Energy Inc. of Canada; and Young Energy Prize of Luxembourg (Sierra Leone Investment and Export Promotion Agency, 2012).

In early February 2012, Anadarko announced the discovery of 98 feet (ft) [30 meters (m)] of hydrocarbon pay in upper Cretaceous reservoirs at its Jupiter-1 well on Block SL-07B-11. Block SL-07B-11 is located 25 km from the Mercury-1 discovery well on Block SL-07B-10, which was drilled by Anadarko in 2010 to a total depth of about 15,950 ft (4,862 m). The drilling of Mercury-1 had yielded 135 ft (41 m) of oil pay in two Cretaceous fan systems, 114 ft (35 m) of which was of light sweet crude oil with a specific gravity of between 34 and 42. Following these two discoveries, Anadarko planned to conduct drill stem testing in the basin. Drill stem testing is used to measure the pressure, permeability, and productive capacity of a geologic formation during the drilling of a well to determine the commercial viability of a hydrocarbon reservoir. Anadarko held a 65% working interest in Block SL-07B-10 in joint venture with Repsol (25%) and Tullow Oil (10%) and a 55% participating interest in Block SL-07B-11 in joint venture with Repsol (25%) and Tullow Oil (20%) (Anadarko Petroleum Corp., 2010, 2012; African Petroleum Corp. Ltd., undated).

In August 2012, the Government launched a petroleum licensing round offering nine blocks for exploration. Block SL-04A-10 was awarded to African Petroleum and Kosmos Energy Ltd. of the United States; Block SL-07A-10, to Elenilto Minerals and Mining LLC of the United States, Minexco Inc. of the United Kingdom, and Signet Petroleum Ltd. of Canada; Block SL-07C-10, to Maters Energy Oil and Gas Ltd. of Nigeria; Blocks SL-08A-10 and SL-08B-10, to Chevron Sahara and Noble Energy Inc. of the United States and ODYE Ltd. of the United Kingdom; Blocks SL-09A-10 and SL-09B-10, to GNBH Sierra Leone Exploration; and Block SL-10B-10, to Varada Petroleum and Hydrocarbons of the United States. There were no bids for Block SL-10A-10. The Government was also searching for a partner to reopen the Sierra Leone Petroleum Refining Co. (Government of the Republic of Sierra Leone State House, 2012; Sierra Leone Investment and Export Promotion Agency, 2012).

Outlook

The African Development Bank projects that Sierra Leone's mining sector contribution to the GDP will increase to 22% in

2013 and reach 30% by 2017, mostly as a result of an increase in iron ore output. Although plans to expand the production capacity of bauxite, gold, iron ore, and titanium mineral operations are likely to boost the economy in the short run, the lack of adequate infrastructure to support mining activities could be a deterrent to future foreign direct investment in the mineral sector. Recent discoveries in the hydrocarbon sector and increased interest by international petroleum companies in exploring for petroleum offshore Sierra Leone suggest the likelihood of increased foreign direct investment in the hydrocarbons sector, however (African Development Bank Group, 2013, p. 2).

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TABLE 1
SIERRA LEONE: PRODUCTION OF MINERAL COMMODITIES^{1,2}

(Metric tons unless otherwise specified)

Commodity		2008	2009	2010	2011	2012
Bauxite ³	thousand metric tons	954	757	1,090	1,300 ^r	776
Cement		254,180	236,240	300,980	310,890	335,400 ^p
Diamond ⁴	carats	371,261 ⁵	400,843 ⁵	437,516 ⁵	357,161 ⁶	541,166 ⁶
Gold, mine output, Au content	kilograms	191	157	270	164 ⁷	141 ⁷
Iron ore:						
Gross weight	thousand metric tons	--	--	--	1,300 ⁸	6,600
Fe content (32% to 58%)	do.	--	--	--	800 ⁸	3,600 ⁹
Titanium:						
Ilmenite concentrate		17,528	15,161	18,206	15,946	22,590
Rutile concentrate		78,908	63,864	68,198	67,916	94,493
Zirconium concentrate		--	5,560	7,092	8,496	610

^pPreliminary. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through August 29, 2013.

²In addition to the commodities listed, lignite reportedly was produced, but available information is inadequate to make a reliable estimate of output.

³Production in dry metric tons.

⁴Source: Kimberley Process Certification Scheme.

⁵About 60% gem quality and 40% industrial quality.

⁶About 80% gem quality and 20% industrial quality.

⁷Source: Bank of Sierra Leone.

⁸Does not include production from the Marampa Mine, which began operating in December 2011.

⁹Iron content of ore for the Marampa Mine [1.5 million metric tons (Mt)] estimated to be 32%; iron content of ore for the Tonkolili Mine (5.1 Mt) estimated to be 59%.

TABLE 2
SIERRA LEONE: STRUCTURE OF THE MINERAL INDUSTRY IN 2012

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bauxite	Sierra Mineral Holdings 1 Ltd. (Vimetco N.V., 100%)	Sierra Minerals Mine, 150 kilometers southeast of Freetown	1,500
Cement	Sierra Leone Cement Corp. Ltd. (HeidelbergCement AG)	Freetown plant	6,000
Diamond	thousand carats Koidu Holdings S.A. (BSG Resources Ltd., 65%, and Magma Diamond Resources Ltd., 35%)	Two kimberlite pipes, 2 kilometers from the district capital of Koidu	120 ¹
Iron ore	African Minerals Ltd., 75%, and Shandong Iron and Steel Group Co. Ltd., 25%	Tonkolili Mine, 190 kilometers northeast of Freetown	10,000
Do.	London Mining plc	Marampa Mine, 150 kilometers northeast of Freetown	3,300
Titanium, ilmenite	Sierra Rutile Ltd.	Sierra Rutile Mine, 130 kilometers southeast of Freetown	23
Titanium, rutile concentrate	do.	do.	100
Zirconium concentrate	do.	do.	10

Do., do. Ditto.

¹Under development.