



# 2008 Minerals Yearbook

---

## MALI AND NIGER

---

# THE MINERAL INDUSTRIES OF MALI AND NIGER

By Omayra Bermúdez-Lugo

## MALI

Mali's mining sector was dominated by the production of gold. No other mineral commodities were produced in significant quantities in the country, with the exception of rock salt and semiprecious stones, such as amethyst, epidote, garnet, prehnite, and quartz. Diamond was produced in small quantities as a byproduct of the mining of gold, but information on diamond production was inadequate to make reliable estimates of output. The country's vast undeveloped mineral resources included bauxite, copper, chromium, diamond, granite, gypsum, iron ore, kaolinite, lead, lithium, manganese, marble, nickel, niobium, palladium, phosphate rock, rutile, talc, tin, titanium, thorium, tungsten, silver, uranium, and zirconium.

Mali is divided into three mining districts: the west mining district, which comprises the administrative region of Kayes; the south mining district, which comprises the southern region of Koulikoro and Sikasso; and the north mining district, which comprises the regions of Gao, Kidal, and Tombouctou. The west mining district, in turn, is subdivided into four mining provinces: a mining province to the north of Kayes, which lies within the Guidimaka region; a mining province to the northeast of Kayes, which lies within the Nioro region; a mining province to the southeast of Kayes, which is host to the Loulo, the Sadiola Hill, the Tabakoto, and the Yatela gold mines, to iron ore and uranium deposits, and to the majority of the country's known kimberlite pipes; and a mining province to the southeast of Kayes, which is host to bauxite, iron ore, limestone, and marble deposits. The south mining district is host to the Kalana and the Morila gold mines; to the Bale, the Kodieram, the Misseni, and the Syama gold deposits; and to the Bougouni lithium deposit. The north mining district is host to the Bah-el-heri and the Dimamou limestone deposits, the Darsset gold deposit, the Tamaguilelt phosphate deposit, the Taoudeni salt mine, the Tassiga manganese deposit, and the Tessalit lead and zinc deposit (Direction Nationale de la Géologie et des Mines, 2008).

The Government agency responsible for the mining sector in Mali is the Direction Nationale de la Géologie et des Mines, which is part of the Ministère des Mines de l'Énergie et de l'Eau.

## Production

Data on mineral production are in table 1.

## Structure of the Mineral Industry

At least 17 international companies were engaged in gold exploration and production in Mali. These included Resolute Mining Ltd. of Australia; Canadian companies African Gold Group Inc., Avion Resources Corp., Avnel Gold Mining Ltd., Axmin Inc., Etruscan Resources Inc., Great Quest Metals Ltd., IAMGOLD Corp., Merrex Gold Inc., North Atlantic Resources Ltd., and Rockgate Capital Corp.; Glencar Mining plc

of Ireland; AngloGold Ashanti Ltd. and Central African Gold (through Mali Gold Fields SA and Songhoi Ressources SA) of South Africa; and Cluff Gold plc and Randgold Resources Ltd. of the United Kingdom. Oklo Uranium Ltd. of Australia explored for phosphate rock and for uranium. Central African Mining and Exploration Company plc (CAMEC) of the United Kingdom explored for bauxite. Table 2 is a list of major mineral industry facilities.

## Mineral Trade

Mali's exports to the United States were valued at about \$5 million in 2008 compared with about \$9.5 million in 2007; gold accounted for \$597,000 of these exports. Imports from the United States were valued at about \$31 million in 2008 compared with about \$32 million in 2007. This total included nearly \$6.1 million for excavating machinery and \$1.2 million for drilling and oilfield equipment (U.S. Census Bureau, 2009a, b).

## Commodity Review

### Metals

**Gold.**—Gold was produced at both the artisanal and industrial levels. Most of the artisanal gold produced in the country came from the Kenieba Valley, which is located about 500 kilometers (km) from the capital city of Bamako. Orpailleurs (artisanal gold miners) recovered gold from alluvial deposits in Kenieba and, to a lesser extent, from other areas throughout the country. At the industrial level, gold was produced from the Kalana, the Loulo, the Morila, the Sadiola Hill, the Syama, the Tabakoto, and the Yatela Mines.

Production from the Kalana underground gold mine decreased by about 15% to 666 kilograms (kg) (reported as 21,407 troy ounces) in 2008 from 789 kg (reported as 25,359 troy ounces) produced in 2007. Avnel estimated that mineral reserves from underground operations at Kalana would be depleted by 2010. The company planned to begin addressing strategies to study the potential for further gold mining in areas within the immediate proximity of the Kalana Mine (Avnel Gold Mining Ltd., 2009, p. 2).

Gold production at the Loulo Mine decreased by 2% to 8,028 kg (reported as 258,095 troy ounces) in 2008 compared with 8,231 kg (reported as 264,647 troy ounces) in 2007. The decrease in production was attributed to lower head grades caused by the delay in the development of underground deposits as the mine was being prepared to transition from an open pit operation to an underground operation (Randgold Resources Ltd., 2009, p. 20-23).

The Morila Mine produced 13,245 kg (reported as 425,828 troy ounces) compared with 13,991 kg (reported as 449,815 troy ounces) in 2007. Randgold reported that mining activities at Morila would cease by April 2009 owing to

depletion of ore by mining. The company planned to continue to process stockpiled material until 2013 (Randgold Resources Ltd., 2009, p. 24-31).

Gold production from the Sadiola Hill open pit gold mine increased by 23% to 14,090 kg from 11,477 kg in 2007 mostly owing to improved recovery rates as a result of the commissioning of a gravity circuit in December 2007, which improved the recovery of both sulfide and oxide ore during the year (AngloGold Ashanti Ltd., 2009, p. 71).

The Tabakoto Mine remained closed during the year. The mine, which was opened in May 2006, had been put on care-and-maintenance status by its previous owner, Nevsun Resources of Canada, in September 2007. In May 2008, Avion acquired an 80% interest in the Tabakoto Mine and the Segala gold project from Nevsun. Avion planned to complete an updated resource estimate for Tabakoto by the first quarter of 2009 and to begin production at Segala shortly thereafter (Avion Resources Corp., 2008a; 2008b, p. 2-3).

Gold production from the Yatela open pit mine decreased by about 45% to 5,132 kg from the 9,362 kg produced in 2007. The decrease in production was attributed to the decline in head grade owing to the underperformance of Pushback 5 (a pushback is a pit that satisfies a number of practical mining requirements, including minimum size and access space), which led to lower grade ore being supplied for stacking at the heap-leach pads (AngloGold Ashanti Ltd., 2009, p. 72).

### **Mineral Fuels and Related Materials**

**Uranium.**—Oklo Uranium completed a combined radiometric and aeromagnetic survey of an area prospective for uranium known as the Kidal project. The company was in the process of completing final interpretations and identifying specific uranium target areas at Kidal and planned to conduct ground geophysics, surface sampling, and geologic mapping to prioritize targets for drill testing (Oklo Uranium Ltd., 2009, p. 4, 10-12).

Rockgate acquired a 60% interest in the Falea project from Delta Exploration Inc. The project, which is prospective for copper, silver, and uranium, is located about 350 km west of Bamako and covers an area of 150 square kilometers (km<sup>2</sup>). As of September 2008, the company had completed 40,000 meters of drilling on the property in 149 diamond drill holes (Rockgate Capital Corp., 2008).

### **References Cited**

- AngloGold Ashanti Ltd., 2009, 2008 annual financial statements: Marshalltown, South Africa, AngloGold Ashanti Ltd., 348 p.
- Avion Resources Corp., 2008a, Avion Resources announces new mining strategy with aim to restart production in Q1 2009 at the Segala and Tabakoto gold projects—Mali: Toronto, Ontario, Canada, Avion Resources Corp. press release, September 16, 3 p.
- Avion Resources Corp., 2008b, Management's discussion and analysis for the three and nine months ended August 31, 2008: Toronto, Ontario, Canada, Avion Resources Corp., 19 p.
- Avnel Gold Mining Ltd., 2009, Management's discussion and analysis for the year ended December 31, 2008: London, United Kingdom, Avnel Gold Mining Ltd. 14 p.
- Direction Nationale de la Géologie et des Mines, 2008, The mines—A genuine investment sector in Mali: Bamako, Mali, Direction Nationale de la Géologie et des Mines, 12 p.

- Oklo Uranium Ltd., 2009, 2008 annual report: Nedlands, Australia, Oklo Uranium Ltd., 70 p.
- Randgold Resources Ltd., 2009, 2008 annual report: St. Helier Jersey, [United Kingdom], Randgold Resources Ltd., 116 p.
- Rockgate Capital Corp., 2008, Rockgate discovers new uranium zone east of the North and Central zones on the U-Ag-Cu Falea project in Mali West Africa: Vancouver, British Columbia, Canada, Rockgate Capital Corp. press release, September 26, 2p.
- U.S. Census Bureau, 2009a, U.S. exports to Mali from 2005 to 2009 by 5-digit end-use code: U.S. Census Bureau. (Accessed June 25, 2009, at <http://www.census.gov/foreign-trade/statistics/product/enduse/exports/c7450.html>.)
- U.S. Census Bureau, 2009b, U.S. imports from Mali from 2005 to 2009 by 5-digit end-use code: U.S. Census Bureau. (Accessed June 25, 2009, at <http://www.census.gov/foreign-trade/statistics/product/enduse/imports/c7450.html>.)

## **NIGER**

In 2008, Niger was ranked as the world's sixth ranked producer of uranium. Other mineral commodities produced in the country included cement, coal, gold, gypsum, limestone, salt, silver, and tin (World Nuclear Association, 2009).

### **Production**

Gold production decreased by 32% to 2,314 kg from a revised 3,427 kg produced in 2007, gypsum production increased by 88% to 8,661 metric tons (t), and silver production increased by 108% to 289 kg. Data on mineral production are in table 1.

### **Structure of the Mineral Industry**

In addition to Paris-based Areva NC, which was the country's sole uranium producer, at least 10 companies were exploring for uranium in Niger in 2008. These companies included Artemis Resources Ltd. of Australia, which held explorations rights for 1,000 square km<sup>2</sup> within the Tim Merso Basin; Bayswater Uranium Corp.; Cameco Corp. of Canada in joint venture with Govi High Power Exploration Inc., which held exploration rights for about 2,300 km<sup>2</sup> in the Arlit region and 2,400 km<sup>2</sup> in the Agadez region; China Nuclear International Uranium Corp.; Homeland Uranium Inc. of Canada, which held the exploration rights for 3,751 km<sup>2</sup> in the Arlit region; Niger Uranium Ltd., which held eight prospecting licenses in Niger covering a total area of 6,773 km<sup>2</sup> in the Tim Merso Basin; North Atlantic Resources Ltd. in joint venture with Orezone Gold Corp., which together held exploration rights for 4,000 km<sup>2</sup> located within 40 km of the Akouta and the Arlit uranium mines; and Oklo Uranium Ltd. (Cameco Corp., 2008; Haggett, 2008; Niger Uranium Ltd., 2008; North Atlantic Resources Ltd., 2008; Artemis Resources Ltd., 2009, p. 11-12; Homeland Uranium Inc., 2009). Table 2 is a list of major mineral industry facilities.

### **Mineral Trade**

Niger's exports to the United States were valued at about \$44.3 million in 2008 compared with about \$9.6 million in 2007; crude petroleum accounted for \$40.9 million of these exports. Imports from the United States were valued at about \$50 million in 2008 compared with about \$69.3 million in 2007.

This total included nearly \$19 million in natural gas liquids, \$790,000 for excavating machinery, and \$89,000 for drilling and oilfield equipment (U.S. Census Bureau, 2009a, b).

## Commodity Review

### Industrial Minerals

**Cement.**—In March, HeidelbergCement AG of Germany sold its share in Société Nigérienne de Cimenterie (SNC) to Damnaz Cement Company Ltd. of Nigeria. SNC operated a cement plant in Malbaza Uzine, southwestern Niger. Niger imported about 65% of its domestic requirements of cement from Benin and Togo. Annual production capacity from Niger's only cement plant was 80,000 t (AllAfrica Global Media, 2008; HeidelbergCement AG, 2008, p. 16).

### Mineral Fuels and Related Materials

**Petroleum.**—China National Oil and Gas Exploration and Development Corp. signed a production-sharing agreement with the Government for the development of the Agadem oilfield. Petroleum reserves at Agadem were estimated to be 324 million barrels. The agreement included the construction of a petroleum refinery in the city of Zinder with a capacity to produce 20,000 barrels per day and a 580-km pipeline linking the Agadem field to the refinery. Production was scheduled to begin in 2011. China planned to invest \$5 billion in the project (Alexander's Gas & Oil Connections, 2008; International Business Times, 2008; Ross, 2008).

**Uranium.**—Production of uranium came from the Akouta underground mine, which was operated by Compagnie Minière d'Akouta (COMINAK), and the Arlit open pit mine, which was operated by Société des Mines de l'Aïr (SOMAIR). COMINAK was owned by Areva (34%), the Government of Niger (31%), Overseas Uranium Resources Development Co. of Japan (25%), and ENUSA Industrias Avanzadas, S.A. of Spain (10%). SOMAIR was owned by Areva (63.4%) and the Government of Niger (36.6%). About 2,000 people worked for the Akouta and the Arlit Mines, in addition to 160 employees at Areva's Niger platform based in the capital city of Niamey (Areva NC, 2009, p. 80).

In 2008, Areva continued with its plans to develop the world-class Imouraren uranium deposit at a cost of \$1.4 billion. The Imouraren project is located about 160 km north of Agadez and 80 km south of Arlit. Uranium reserves at Imouraren were estimated to be 180,000 t. Areva had received an exploration permit for Imouraren in 2006 and in mid-2008 had submitted a feasibility study and an environmental impact assessment to the Government. Areva received a mining permit for the deposit in early January 2009. The mine, which was expected to begin production in 2012, would produce about 5,000 metric tons per year of uranium. Ownership in the project was to be shared between Areva and the Government, which would hold a 66.65% and a 33.35% interest, respectively (Areva NC, 2009, p. 80, 92, 195).

During the year, the Niger Movement for Justice (NMJ), which was a Tuareg-led rebel movement, kidnapped four

employees from Areva's Akouta Mine. The NMJ had longstanding grievances with the Government concerning uranium-rich land in the Agadez region. The group claimed that revenues from uranium mining in Agadez were not being used for development projects in the region and demanded that up to 30% of uranium revenue be allocated to the country's northern region (Ghanmi, 2008; Magnowski and Massalatchi, 2008).

Oklo Uranium held four uranium exploration permits for the Elmeki project, which covers the western margin of the Aïr Massif. An airborne geophysical survey was conducted across the entire area of the project by the Government in collaboration with the European Community. Oklo planned to purchase the existing geophysical data to identify exploration targets, which could be followed up with ground exploration to locate targets using ground geophysics, mapping, and sampling (Oklo Uranium Ltd., 2009, p. 4, 10-12).

## References Cited

- Alexander's Gas & Oil Connections, 2008, Oil discovery in Niger ignites elongation debate for president: Alexander's Gas & Oil Connections, v. 13, no. 23, December 23, 2 p.
- AllAfrica Global Media, 2008, Ciment—Niamey victim collaterale: AllAfrica Global Media, May 19. (Accessed October 7, 2009, at <http://fr.allafrica.com/stories/printable/200805191425.html>.)
- Areva NC, 2009, 2008 reference document: Paris, France, Areva NC, 476 p.
- Artemis Resources Ltd., 2009, Annual report for the year ended June 2009: Perth, Australia, Artemis Resources Ltd., 63 p.
- Cameco Corp., 2008, Cameco acquires uranium exploration interest in Niger: Saskatoon, Saskatchewan, Canada, Cameco Corp. press release, August 22, 2 p.
- Ghanmi, Lamine, 2008, Niger's Tuareg rebels demand share of uranium cash: Thomson Reuters, July 20. (Accessed August 25, 2008, <http://www.alertnet.org/thenews/newsdesk/L20182175.htm>.)
- Haggett, Scott, 2008, Cameco takes stake in Niger uranium explorer: Thompson Reuters, August 22. (Accessed April 20, 2009, at <http://www.reuters.com/article/idUSN2234325220080822>.)
- HeidelbergCement AG, 2008, Interim report—January to September 2008: Heidelberg, Germany, HeidelbergCement AG, 17 p.
- Homeland Uranium Inc., 2009, 2008 annual report: Toronto, Ontario, Canada, Homeland Uranium Inc., 8 p.
- International Business Times, 2008, Niger in \$5 billion oil contract with China: International Business Times, June 5. (Accessed January 14, 2009, at <http://www.ibtimes.com.hk/articles/20080605/oil-contract.htm>.)
- Magnowski, Daniel, and Massalatchi, Abdoulaye, 2008, Areva's Niger uranium mine to go ahead despite price fall: Thomson Reuters, December 20. (Accessed December 7, 2009, at <http://uk.reuters.com/article/idUKL14267220081220>.)
- Niger Uranium Ltd., 2008, 2008 exploration drilling campaign has commenced on Niger licenses: Niger Uranium Ltd. press release, January 28, 4 p.
- North Atlantic Resources Ltd., 2008, Orezone and North Atlantic form uranium exploration company: Toronto, Ontario, Canada, North Atlantic Resources Ltd. press release, February 6, 3 p.
- Oklo Uranium Ltd., 2009, 2008 annual report: Nedlands, Australia, Oklo Uranium Ltd., 70 p.
- Ross, Will, 2008, Outcry over China-Niger oil deal: BBC News, July 30. (Accessed January 14, 2009, at <http://news.bbc.co.uk/2/hi/africa/7534315.stm>.)
- U.S. Census Bureau, 2009a, U.S. exports to Niger from 2005 to 2009 by 5-digit end-use code: U.S. Census Bureau. (Accessed June 25, 2009, at <http://www.census.gov/foreign-trade/statistics/product/enduse/exports/c7510.html>.)
- U.S. Census Bureau, 2009b, U.S. imports from Niger from 2005 to 2009 by 5-digit-end-use code: U.S. Census Bureau. (Accessed June 25, 2009, at <http://www.census.gov/foreign-trade/statistics/product/enduse/imports/c7510.html>.)
- World Nuclear Association, 2009, World uranium mining—Production from mines: London, United Kingdom, World Nuclear Association, July. (Accessed July 20, 2009 at <http://www.world-nuclear.org/info/inf23.html>.)

TABLE 1  
MALI AND NIGER: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Country and commodity	2004	2005	2006	2007	2008
MALI <sup>2</sup>					
Gold, mine output, Au content <sup>3</sup>	37,911	44,230	51,957	43,850	41,160
Salt <sup>e</sup>	6,000	6,000	6,000	6,000	6,000
Semiprecious stones <sup>4</sup>	NA	NA	10,000	10,000 <sup>e</sup>	10,000 <sup>e</sup>
NIGER <sup>5</sup>					
Cement, hydraulic <sup>e</sup>	59,200 <sup>r</sup>	83,400 <sup>r</sup>	62,000 <sup>r</sup>	42,000 <sup>r</sup>	40,000
Coal, bituminous	183,000 <sup>e</sup>	182,060	176,320	171,296	182,912
Gold, mine output, Au content	684 <sup>6</sup>	4,962	2,615	3,427 <sup>r</sup>	2,314
Gypsum	17,700 <sup>e</sup>	17,417	13,043	4,615	8,661
Limestone	146,000	146,000	146,000	146,000	146,000
Salt <sup>e</sup>	2,000	1,269 <sup>7</sup>	1,300	1,300	1,300
Silver, mine output, Ag content	NA	201	100 <sup>e</sup>	139 <sup>r</sup>	289
Sulfuric acid: <sup>e</sup>					
Gross weight	70,000	70,000	70,000	70,000	70,000
Sulfur content	23,000	23,000	23,000	23,000	23,000
Tin, mine output, Sn content	30 <sup>e,r</sup>	14	13	11	10 <sup>e</sup>
Uranium, U content	3,282	3,093	3,434	3,153	3,032

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits. <sup>r</sup>Revised. NA Not available.

<sup>1</sup>Table includes data available through October 7, 2009.

<sup>2</sup>Mali also produced sand and gravel solely for domestic consumption, but information is inadequate to make reliable estimates of output.

<sup>3</sup>Excludes artisanal production, which is estimated to be about 4,000 to 5,000 kilograms per year.

<sup>4</sup>Artisanal production of semiprecious stones includes amethyst, epidote, garnet, prehnite, and quartz.

<sup>5</sup>In addition to the commodities listed, phosphate rock, tungsten ore, and a variety of construction materials (clays, sand and gravel, and stone) were produced, but information is inadequate to make reliable estimates of output.

<sup>6</sup>Does not include production from artisanal miners.

<sup>7</sup>Reported figure.

TABLE 2  
MALI AND NIGER: STRUCTURE OF THE MINERAL INDUSTRIES IN 2008

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
MALI				
Gold	kilograms	Société de la Mine d'or de Kalana (Avel Gold Mining Ltd., 80%, and Government, 20%)	Kalana Mine, 300 kilometers south of Bamako	900.
Do.	do.	Société des Mines de Loulo (Randgold Resources Ltd., 80%, and Government, 20%)	Loulo Mine, 350 kilometers west of Bamako	7,800.
Do.	do.	Morila S.A. [a subsidiary of Morila Ltd., 80% (AngloGold Ashanti Ltd., 40%; Randgold Resources Ltd., 40%; Government, 20%)]	Morila Mine, 180 kilometers southeast of Bamako	13,000.
Do.		Société d'Exploitation des Mines d'Or de Sadiola S.A. (AngloGold Ashanti Ltd., 38%; IAMGOLD Corp., 38%; Government, 18%; International Finance Corporation, 6%)	Sadiola Hill Mine, 77 kilometers south of Kayes	5,300,000 ore.
Do.	kilograms	Société des Mines de Syama S.A. (Resolute Mining Ltd., 80%, and Government, 20%)	Syama Mine, 300 kilometers southeast of Bamako	7,800.
Do.	do.	Société d'Exploitation des Mines d'Or de Yatela (AngloGold Ashanti Ltd., 40%; IAMGOLD Corp., 40%; Government, 20%)	Yatela Mine, 50 kilometers southwest of Kayes	2,500,000 ore.
Do.	do.	Avion Resources Corp., 80%	Tabakoto Mine, Kenieba Valley	On maintenance.
Do.	do.	Artisanal miners	Kenieba Valley	5,000.
NIGER				
Cement		Société Nigérienne de Cimenterie (Damnaz Cement Company Ltd.)	Malbaza Uzine, southwestern Niger	80,000.
Coal		Société Nigérienne de Charbon (SONICHAR)	Anou Araren, central Agadez region	300,000.
Gold	kilograms	Société des Mines du Liptako S.A. (SML) [African GeoMin Mining Development Corp. Ltd. (which is owned by Etruscan Resources Inc., 50%, and Semafo Inc., 50%), 80%, and Government, 20%]	Samira Hill Mine, 90 kilometers west of Niamey	3,000.
Uranium		Compagnie Minière d'Akouta (COMINAK) [Areva NC, 34%; Government, 31%; Overseas Uranium Resources Development Co., 25%; ENUSA Industrias Avanzadas S.A., 10%]	Akouta underground mine, northern Niger	2,500.
Do.		Société des Mines de l'Air (SOMAIR) (Areva NC, 63.4%, and Government, 36.6%)	Arlit open pit mine, 6 kilometers northwest of Arlit, Agadez Region	2,300.
Do. do. Ditto.				

