

THE MINERAL INDUSTRY OF SUDAN

By Thomas R. Yager

In Sudan, rising production of crude petroleum in recent years has substantially increased the mineral sector's influence on the national economy. Other mineral commodities produced included cement, chromite, gold, gypsum, marble, refined petroleum products, salt, semimanufactured steel, and silver. Sudan is also known to have deposits of barite, copper, iron ore, kyanite, lead, nickel, talc, tungsten, wollastonite, and zinc.

Sudan's real gross domestic product (GDP) increased by 7.3% in 2004 after rising by 6% in 2003. In 2003, the mining sector accounted for 10% of the GDP; manufacturing, 8%; building and construction, 5%; and electricity and water, 2%. In 2004, the nominal GDP amounted to about \$77 billion when adjusted for purchasing power parity. Per capita GDP at purchasing power parity was about \$2,200 (International Monetary Fund, 2005, p. 208; 2005¹; Bank of Sudan, undated, p. 27).

Civil war and social strife in Sudan limited, to a large extent, investment in the mineral sector and other sectors of the economy. Sanctions by the United Nations (1996) and the United States (1997) set legal barriers to investment in the country and were followed by the Sudan Peace Act that was ratified by the Congress of the United States in 2002. The purpose of the Sudan Peace Act was to block loans from international financial institutions if the Government of Sudan rejected negotiations with the Sudanese People's Liberation Army (SPLA). Revenues from petroleum sales, which allegedly were used to finance operations in the Sudan conflicts, constituted one of the reasons for promulgating the Act (U.S. Department of the Treasury, 2000; Africa Energy Intelligence, 2002).

In May 2004, the Government and the SPLA signed six protocols on issues that related to the peace process. The Government and the SPLA previously signed an agreement to share Sudan's petroleum revenues in December 2003. On December 31, 2004, the Government signed a permanent cease-fire with the SPLA, and an agreement on the implementation of the protocols was signed in May (United Nations Integrated Regional Information Networks, 2005).

Commodity Review

Metals

Gold.—The Ariab Mining Company Ltd. (AMC) operated Sudan's only large-scale gold mine, which included the Baderuk, the Hadal Auatib, and the Oderuk deposits. The company held other concessions in Sudan. AMC was expected to produce 5,000 kilograms (kg) of gold in 2005 (Sudan News Agency, 2004).

Artisanal miners produced gold at Gugub in the Ingessana Hills and on the Blue Nile River in the Balguwa region in

southeastern Sudan. Red Rock Mining (a subsidiary of Sudan Master Technology) planned to develop a mining operation at the deposit worked by artisanal miners in Balguwa. The company purchased a gold-processing plant in early 2004 (Heins, 2005).

In 2004, national gold exports were reported to be 6,673 kg at a value of \$50.4 million, or about 1% of total exports. In addition to the gold produced and exported by AMC and Sudanese artisanal miners, some of Ethiopia's artisanal gold output was reported to be smuggled through Sudan (Bank of Sudan, 2004).

Iron and Steel.—Sudan Master Technology operated a meltshop and rolling mill in Giad Industrial City. In 2003, the production of rebar at Giad Industrial City increased to 63,936 metric tons (t) compared with 53,035 t in 2002. Hafez el Barbary and Sudanese Malaysian Co. had a combined galvanized steel production capacity of 15,000 metric tons per year (t/yr) (Glasson, 2003; Bank of Sudan, undated, p. 41).

In 2003, Sudan's apparent consumption of finished steel amounted to 405,000 t compared with 289,000 t in 2002 and 398,000 t in 1998. In 2004, imports of iron and steel were \$342 million compared with \$225 million in 2003. Iron and steel accounted for 8% of Sudan's total imports (Bank of Sudan, 2004; International Iron and Steel Institute, 2004, p. 91).

Industrial Minerals

Cement.—The Atbara and the Rabak cement plants had a combined capacity of 500,000 t/yr. In 2003, production at Atbara rose to 199,900 t from 162,800 t (revised) in 2002; production at Rabak rose to 72,000 t from 42,000 t (revised). Higher cement production was the result of maintenance and rehabilitation at Atbara and Rabak (Bank of Sudan, undated, p. 46).

Mineral Fuels

In 2004, Sudan's production of crude petroleum increased to about 118 million barrels (Mbbbl) from 103.4 million barrels (revised) in 2003 and 87.76 Mbbbl in 2002. Sudan accounted for nearly 4% of African crude petroleum production in 2003. In 2004, petroleum reserves were no less than 2.6 billion barrels (Gbbbl).

The Greater Nile Petroleum Operating Company (GNPOC), which was a joint venture of China National Petroleum Corp. (CNPC) (40%), Petronas Carigali Overseas Shd. Bhd. of Malaysia, (30%), ONGC Videsh Ltd. of India (25%), and Sudan Petroleum Company Ltd. (Sudapet) (5%), held Blocks 1, 2, and 4 in south-central Sudan. GNPOC produced crude petroleum from the Bamboo, the Diffra, the El Toor, the Grand Heglig, the Khairat Northeast, the Tooma South, and the Unity oilfields. In 2004, GNPOC produced 314,800 barrels per day (bbl/d) from Blocks 1, 2, and 4 compared with 283,400 bbl/d in 2003.

¹A reference that includes a section mark (§) is found in the Internet Reference Cited section.

Reserves in Blocks 1, 2, and 4 were estimated to be more than 1 Gbbl in 2004 (Nield, 2004).

CNPC held Block 6, which is located to the northwest of Muglad. Reserves in Block 6 were reported to be 700 Mbbl. In March 2004, CNPC started production at the Fula Field in Block 6 at a rate of 10,000 bbl/d. Production was expected to rise to 68,000 bbl/d in 2005 and 99,000 bbl/d in 2006 and 2007 (Nield, 2004; Africa Energy Intelligence, 2005a).

Blocks 3 and 7 in eastern Sudan were held by the Petrodar Consortium [CNPC (41%), Petronas (40%), Sudapet (8%), Gulf Petroleum Company of Qatar (6%), and the Al-Thani Group of Sudan (5%)]. The Adar-Yale field near Malakal produced small amounts of crude petroleum that were refined at El Obeid. Blocks 3 and 7 had reserves of 775 Mbbl. CNPC, which was the operating company, expected to produce 170,000 barrels per day (bbl/d) in Blocks 3 and 7 in the second half of 2005. Production could rise to 300,000 bbl/d by the end of 2006 (Nield, 2004).

Blocks 5A and 5B were located in the Muglad Basin. Block 5A was held by a consortium that consisted of Petronas (69%), ONGC Videsh (24%), and Sudapet (7%). Reserves at the Thar Janh field in Block 5A were reported to be 150 Mbbl. Block 5B was held by Petronas (39%), Lundin Petroleum AB of Sweden (24.5%), ONGC Videsh (23.5%), and Sudapet (13%). In 2004, operations in Block 5B remained on hold because of security concerns (Nield, 2004; Lundin Petroleum AB, 2005, p. 3).

In December 2004, Total SA, Marathon Oil Corp., and Kuwait Petroleum Corp. renegotiated their production-sharing agreement with the Government for Block B in southern Sudan. The original agreement was signed in 1983; the companies had suspended their involvement because of civil unrest. At the end of 2004, Total had not set a date for the resumption of exploration (Africa Energy Intelligence, 2005d).

Zafir Company of Pakistan held Block 9 in eastern Sudan. In October 2004, the Government awarded Block 11, which covered the States of Gezira, North Kordofan, Northern, and White Nile to the west of Block 9, to Zafir. In late 2004, the state-owned company PetroSA (Pty) Ltd. of South Africa signed an evaluation pact with the Government for Block 14 in northwestern Sudan. Cliveden Petroleum Company of Great Britain, the Government of Khartoum State, and Sudapet held Block C, which is located to the west of Block 6 in western Sudan. Petronas held Block 8, which is located in eastern Sudan. Cliveden and Zafir sought joint-venture partners to aid the development of their projects (Africa Energy Intelligence, 2005b-d).

At the end of 2004, Block 10 in Gedaraf State, Block 12 in Darfur State, and Blocks 13 and 15 on the Red Sea remained unawarded. The civil war in Darfur prevented the development of Block 12 (Africa Energy Intelligence, 2005d).

In 2004, exports of crude petroleum were \$2.96 billion compared with \$1.93 billion in 2003 and \$1.4 billion in 2002. Crude petroleum accounted for 78% of the value of Sudan's total exports in 2004 and 85% of the growth in total exports from 2002 to 2004 (Bank of Sudan, 2004).

In 2003, Sudan's output of petroleum products increased to nearly 22.8 Mbbl from 22 Mbbl in 2002 (table 1). The

Khartoum Oil Refinery, which was operated by CNPC, accounted for 81% of the national petroleum products output in 2003. The refinery had a capacity of 50,000 bbl/d in 2004; CNPC planned to increase capacity to 100,000 bbl/d. The upgrade was expected to cost \$340 million. In November 2003, the Government awarded a contract to ONGC Videsh to increase the capacity of the Port Sudan Refinery to 100,000 bbl/d from 25,000 bbl/d. The upgrade was expected to cost \$400 million (Clark, 2004). Sudan also had topping plants at Abu Jabra, El Obeid, and Sharjirah that produced mainly heavy fuel oil.

In 2004, exports of petroleum products amounted to \$143 million, or nearly 4% of total exports. Imports of petroleum products were \$101 million in 2004 compared with nearly \$149 million in 2003. Imports of petroleum products accounted for about 2% of Sudan's total imports (Bank of Sudan, 2004).

Infrastructure

In 2003, domestic production of electricity was 3,354 gigawatthours (GWh) compared with 3,094 GWh in 2002. Thermal power stations accounted for 65% of output in 2003, and hydroelectric plants, 35%. Domestic consumption of electricity increased to 2,320 GWh in 2003 from 1,758 GWh in 2002; industrial consumption rose to 513.5 GWh from 343 GWh (Bank of Sudan, undated, p. 49-50).

The 1,540-kilometer (km) pipeline that ran from Block 1A to Port Sudan had a capacity of 280,000 bbl/d; the addition of pumping stations could increase capacity to 450,000 bbl/d. In 2004, CNPC was building a 730-km crude petroleum pipeline from the Fula Field in the Block 6 oilfields to the Khartoum Oil Refinery; the pipeline was expected to be completed by mid-2005. A consortium of Indian companies led by ONGC Videsh was building a 741-km petroleum products pipeline from the Khartoum Oil Refinery to Port Sudan. The pipeline was expected to be completed in September 2005 (Clark, 2004; Nield, 2004).

Outlook

The International Monetary Fund (2005, p. 208) predicted that Sudan's GDP would rise by 8.3% in 2005 and 8.6% in 2006. High rates of GDP growth may lead to increased demand for such local construction materials as cement, gravel, limestone, marble, and sand. With the start of production in Blocks 3, 6, and 7, Sudan's crude petroleum output could rise to as much as 500,000 bbl/d by the end of 2005 and to 650,000 bbl/d by the end of 2006. Plans to increase petroleum production depend upon political stability; the success of the peace agreement between the Government and the SPLA is a key factor. Successful implementation of the peace agreement could lead to the resumption of exploration activity in Block 5B. The separate conflict in Darfur, which contained parts of Blocks C and 12, remained unresolved at the end of 2004 (Nield, 2004; Sudan News Agency, 2004; United Nations Integrated Regional Information Networks, 2004).

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TABLE 1
SUDAN: PRODUCTION OF MINERAL COMMODITIES¹

Commodity ²		2000	2001	2002	2003	2004 ^e
Cement, hydraulic	metric tons	145,800	189,500	204,800 ^r	271,900 ^r	280,000
Chromite, mine output, gross weight ³	do.	28,500 ^r	20,500 ^r	14,000 ^r	37,000 ^r	26,000 ⁴
Gold, mine output, Au content ⁵	kilograms	5,774	5,417	5,239	5,106 ^r	5,000
Gypsum	metric tons	13,808	2,422	4,540	13,304 ^r	14,000
Marble	cubic meters	NA	15,500	22,000	22,000 ^e	22,000
Petroleum:						
Crude, including lease condensate	thousand 42-gallon barrels	67,152	77,755	87,759	103,400 ^r	118,000
Refinery products:						
Liquefied petroleum gas	do.	1,656	2,493	2,792	2,658 ^r	2,700
Gasoline	do.	6,456	8,228	8,725	9,423 ^r	9,400
Naptha	do.	--	198	303	260 ^r	260
Jet fuel	do.	--	910	1,339	1,236 ^r	1,200
Kerosene	do.	250	230	259	282 ^r	280
Distillate fuel oil	do.	--	6,282	6,599	6,400 ^r	6,400
Residual fuel oil	do.	4,160	1,656	1,991	2,503 ^r	2,500
Total	do.	12,522	19,997	22,008	22,762 ^r	22,700
Salt	metric tons	86,599	77,783	83,340	61,096 ^r	62,000
Silver	kilograms	NA	1,598	3,256	2,844 ^r	2,900
Steel, semimanufactured	metric tons	NA	42,785	53,035	63,936	64,000

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

¹Includes data available through August 16, 2005.

²In addition to the commodities listed, the following are presumably produced although available information is inadequate to estimate output: clay and/or shale for cement manufacture (normally about 0.4 metric ton of clay and/or shale per metric ton of finished cement); limestone for cement manufacture (normally at least 1.25 metric tons per metric ton of finished cement); agriculture, lime manufacture, and construction aggregate and fill; other construction materials (clays, sand and gravel, stone, and others for local use); and mica.

³Presumed to be ores and concentrates with an estimated average grade of about 54% chromic oxide.

⁴Reported figure.

⁵Does not include artisanal output.

TABLE 2
SUDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Atbara Cement Company Ltd. (LaFarge Group of France and Dal Group of Sudan)	Plant at Atbara	400,000.
Do.		Nile Cement Company (Government, 100%)	Plant at Rabak	100,000.
Chromite		Ingessana Hills Mines Corp.	Mine at Ingessana Hills	48,000.
Do.		Elneelain Works Co.	NA	NA.
Gold	kilograms	Compagnie Miniere Or (Government of Sudan, 60%, and Ariab Mining Company Ltd., 40%)	Mine at Ariab	5,000.
Gypsum		Sudanese Mining Corp. (Government, 100%)	Bir Eit Mine	15,000.
Limestone		Atbara Cement Company Ltd.	Mine at Atbara	500,000.
Do.		Nile Cement Company	Mine at Rabak	200,000.
Marble		Makawi's Factory for Marble and Granite	NA	NA.
Do.		Stones & Marbles Co.	NA	NA.
Do. ¹		Al Masarra Co. Ltd.	Mines at Atbara and El Jebelain	NA.
Do. ¹		Imtco Mining Co.	Mine at Synkat	NA.
Mica		Sudanese Mining Corp. (Government, 100%)	Sheriek Mines	1,800.
Petroleum:				
Crude	thousand barrels	Greater Nile Petroleum Operating Co. [China National Petroleum Corp. (CNPC), 40%; Petronas Carigali Overseas Shd. Bhd., 30%; ONGC Videsh Ltd., 25%; Sudan Petroleum Company Ltd. (Sudapet), 5%]	Block 1, El Toor, Tooma South, and Unity Fields; Block 1A, Khairat and Munga Fields; Block 2, Grand Heglig Field (Barki, Hamra, Heglig, Kanga Laloba, Rihan, and Toma Fields); Block 2A, Bamboo and Garaad Fields; Block 4, Diffra Field	120,000.
Do.	do.	Petrodar Consortium (China National Petroleum Corp., 41%; Petronas Carigali Overseas Shd. Bhd., 30%; Sudan Petroleum Company Ltd., 8%; Gulf Petroleum Company of Qatar, 6%; Al-Thani Group, 5%)	Blocks 3 and 7	3,650.
Do.	do.	China National Petroleum Corp.	Block 6 (Fula Field)	3,650.
Refined	do.	Khartoum Oil Refinery (China National Petroleum Corp., 50%, and Sudan Petroleum Corp., 50%)	Refinery at Jali	18,250.
Do.	do.	Port Sudan Refining Ltd. (Government, 100%)	Refinery at Port Sudan	93 liquefied petroleum gas; 1,014 gasoline; 898 kerosene; 2,499 diesel fuel; 4,154 residual fuel oil; 458 naphtha.
Do.	do.	Government	Refinery at El Obeid	3,650.
Do.	do.	Concorp Ltd.	Refinery at Shajirah	3,650.
Do.	do.	Government	Refinery at Abu Jabra	730.
Steel:				
Crude		Sudan Master Technology	Plant at Giad Industrial City	60,000.
Rebar		do.	do.	150,000.
Galvanized		Sudanese Malaysian Co.	NA	8,000.
Do.		Hafez el Barbary	NA	7,000.

NA Not available.

¹Out of operation since 2001.