

THE MINERAL INDUSTRY OF CHAD

By Philip M. Mobbs

Chad is Africa's newest petroleum-producing country. The recent development of petroleum resources significantly increased the relevance of mineral resources to the nation's economy, which had been dominated by commerce and trade [24.6% of the gross domestic product (GDP) in 2002 (the last year for which detailed data were available)], agriculture (17.6%), and livestock (16.6%). The impact of the mineral sector on employment was minimal, especially with the completion of the Chad-Cameroon oil pipeline in 2003 and subsequent demobilization of the construction crews; subsistence farming still employed 80% of the total population, which was estimated to be about 9 million in 2004. Chad remained the focus of international attention to see if revenue derived from the development of the country's oil resources will be managed to benefit the nation and its population or if the country will be the latest example of the dissolution of wealth from natural resource development (Gary and Reisch, 2005, p. 4-12; Georgiou and others, 2004, p. 6-7; International Finance Corp., 2004a; International Monetary Fund, 2005, p. 24; Sachs and Warner, 1995, p. 1-7; World Bank Group, 2004; Pegg, 2005¹; Spera, 2004²).

Landlocked Chad shares borders with the central African countries of Cameroon, the Central African Republic, Libya, Niger, Nigeria, and Sudan. Chad was the fifth largest country in Africa with an area of 1,284,999 square kilometers (km²). In 2004, the GDP at current prices was estimated to have increased to about \$4.2 billion.² As a result of the first full year of crude oil production and exportation, real GDP increased at an annual rate of 30.7% compared with 9.7% in 2003. The growth placed Chad second on the list of greatest annual percent change of real GDP in 2004 after Equatorial Guinea. The International Monetary Fund (2005³) reported that Chad's GDP based on purchasing power parity was more than \$13.4 billion in 2004 and that GDP per capita based on purchasing power parity was \$1,627.

Since the initiation of oil production in 2003, oil has overshadowed the limited suite of other produced mineral commodities, which include aggregates, clay, gold, lime, limestone, natron (soda ash), salt, sand, and stone. In addition to these commodities, previous geologic studies in Chad have identified a variety of mineralized areas that include bauxite, columbium (niobium) and tantalum, diamond, diatomite, granite, graphite, iron, kaolin, marble, silica sand, talc, tin, and tungsten. Chromium, copper, gypsum, lead, manganese, nickel, platinum, titanium, uranium, and zinc occurrences also were

noted (Ministère des Mines, de l'Énergie et du Pétrole, 1995, p. 24-38).

Trade

Crude oil was exported via the Chad-Cameroon pipeline and its export terminal at Kribi, Cameroon. Most other formal international trade with landlocked Chad was funneled through seaports in Cameroon and Nigeria. In 2004, the value of exports from Chad was estimated to be \$2.1 billion compared with a revised \$451 million in 2003, of which crude oil exports were valued at about \$1.9 billion in 2004 compared with \$224 million in 2003. In 2004, imports into Chad were estimated to be \$922.7 million compared with a revised \$846.8 million in 2003. The completion of the Chad-Cameroon pipeline and the development of the initial three oilfields in the Doba Basin accounted for the decline in the value of imports for the oil sector to \$428.9 million in 2004 from \$472.7 million in 2003. Oilfield imports were not expected to become negligible in the short term because Esso Exploration and Production Chad Inc. (Esso Chad) was authorized to begin construction of the 25-well Moundouli and the 4-well Nya Fields in 2005 (International Monetary Fund, 2005, p. 29; Esso Exploration and Production Chad Inc., 2005⁴).

Structure of the Mineral Industry

In Chad, the Ministère du Plan, du Développement, et de la Coopération, the Ministère des Mines et de l'Énergie, and the Ministère du Pétrole were responsible for developing policy that affected various sectors of the mineral industry. The Direction des Recherches Géologiques et Minières organized mineral sector investigations, and the Direction du Pétrole was responsible for the administration of the petroleum sector. The Petroleum Code was under revision by the Government.

Most minerals in Chad, such as clay, gold, natron (soda ash), salt, sand and gravel, and stone, were produced by small-scale local miners. Independent and major international oil companies were involved in the exploration for and production of crude oil. Esso Chad and Tchad Oil Transportation Co. S.A. operated about 200 kilometers (km) of the 1,070-km Chad-Cameroon crude oil pipeline that was in Chad.

Commodity Review

Metals

Gold.—In 2002, Global Resources Corp. (a subsidiary of Afko Corea Ltd. of South Korea) had suspended active operations on a small placer gold deposit at Gamboké to complete a feasibility study. Prospecting had continued at Goïn, Goïgoudoum, and Massonébaré. Besides local artisanal gold operations, activity in the sector was minimal in 2004.

¹References that include a section mark (§) are found in the Internet References Cited section.

²Where necessary, values have been converted from Communauté Financière Africaine francs (XAF) to U.S. dollars (US\$) at the average rate of XAF534.4=US\$1.00 for 2004 and XAF580.1=US\$1.00 for 2003. Purchasing power parity valuation was based on the average rate of XAF188.1=US\$1.00 for 2004.

Mineral Fuels

Petroleum.—Esso Chad, which was a venture of Exxon Mobil Corp. of the United States (40% equity interest), Petronas Carigali Overseas Sdn. Bhd. of Malaysia (35%), and Chevron Overseas Petroleum Inc. of the United States (25%), started production from the Komé Field in the first quarter of 2004 and from the Bolobo Field in the third quarter. In 2005, in addition to exploration of the Moundouli and the Nya Fields, Esso Chad was expected to continue exploration of the Belanga, the Mangara, and the M'Bikou prospects.

Various factions within Chad expressed displeasure with the price received for the exported crude. Crude oil from the Bolobo, the Komé, and the Miandoum Fields was blended at Esso Chad's central treating facility at Komé. ChevronTexaco released an assay of the Doba Blend crude in early 2004 prior to the addition of the Bolobo feed. At that time, the Doba Blend crude had a value of 20.5° American Petroleum Institute (API) gravity, a sulfur (S) content of 0.16%, and a total acid number of 4.1 milligrams (mg) potassium hydroxide per gram (KOH/g) oil compared with Brent Blend benchmark crude oil, which has a 38.5° API gravity, 0.43% S, and a total acid number of 0.03 mg KOH/g; Brent Blend is classified as light (30° API or higher) and sweet (less than 1.5% sulfur by weight). Various Nigerian crudes that would have similar seaborne transportation costs as oil from Chad included Brass River, 43.5° API, 0.07% S; Qua Ibo, 35.6° API, 0.1% S; Bonny Light 34.5° API, 0.1% S, and 0.27 mg KOH/g; and Escravos, 34.2° API, 0.15% S, and 0.53 mg KOH/g. The published ChevronTexaco assay would place the Doba Blend crude oil in the heavy, sweet, high-acid crude category, which had marketing problems despite the well-publicized increase in crude oil prices in 2004. In general, most crude oil refineries in China and Europe were designed to process light crude oil. Compared with the price of a light crude, such as Brent, heavy crude oil sold at a discount, which ranged from about \$8 at the beginning of 2004 to more than \$16 at yearend. Additional costs that reduced the income from the exported Doba Blend included the cost of transportation of the crude oil from Chad to the export terminal in Cameroon. Debt repayment, recovery of investment in the pipeline by the partners, operation and maintenance fees, and transit fees were included in the transportation cost and totaled about \$10 per barrel (Platt's, 1999§; Africa Energy Intelligence, 2004; Oil & Gas Journal, 2004; Agence France Press, 2004§; Esso Exploration and Production Chad Inc., 2005§; Saunders, 2005§).

Other points of contention included the delay (until the project has ended) in payment for produced oil that had been used to fill the pipeline and Esso Chad's use of production data measured at the Kribi export terminal in Cameroon instead of at the Komé pumping station in Chad. Crude oil volume, which was metered at Komé, reportedly was 1.4% higher than that measured at Kribi; this was a difference of about 700,000 barrels for the period that ranged from the start of pumping in 2003 until yearend 2004 (Presidential Press Service, 2004; Gary and Reisch, 2005, p. 26, 48-50).

In 2004, EnCana Corp. of Canada, which had acquired a 50% interest in the Permit H concession from Cliveden Petroleum

Co. Ltd. of the British Virgin Islands in 2002, drilled four exploration wells and acquired additional seismic data on the Permit H concession. Also in 2004, Citic Resources Holdings (a subsidiary of China International Trust & Investment Corp.) obtained 25% interest in the Permit H concession from Cliveden. As part of its continued bankruptcy proceedings, Trinity Energy Resources, Inc. of the United States resolved some of its legal differences with Cliveden. Trinity, which had farmed out much of its interest in its Permit H concession to Cliveden in 1999, would increase its interest in the concession to 10%.

In December, Energem Petroleum (Chad) Ltd. (a subsidiary of Energem Resources Inc. of Canada) was awarded the Chari West and the Largeau oil and gas concessions. The 8,200-km² Chari West concession was in the Doba Basin, and the more than 251,000-km² Largeau concession was in central and northern Chad (Energem Resources Inc., 2004).

There was little physical progress on the redevelopment of the Sedigui oilfield and construction of a small oil refinery at Farcha, although in 2004, the Industrial Development Corporation of South Africa Ltd. had been approached to finance the refinery.

Infrastructure

Surface transportation in Chad was difficult. Of the nation's 40,000-km network of roadways and trails, only about 650 km was paved; the rest were passable in the dry season. The Government proposed to pave more roads in southern agricultural areas. Electricity was available in the capital of N'Djamena but was subject to frequent outages. Other areas in the country relied primarily on small diesel-fueled generators or solar cells. Fuel for the generators was imported from Cameroon and Nigeria. The telecommunications infrastructure was limited.

Outlook

To some extent, the World Bank's future participation in the advancement of the extractive industries of developing countries depends on the positive transformation of Chad's economy by the Chad-Cameroon export pipeline project. The pipeline, however, was completed nearly a year ahead of schedule, and the development of the initial three Doba Basin oilfields was accomplished 5 months ahead of schedule, which resulted in the Government's Oil Revenue Management System not keeping up with the actual progress of the oilfield facilities and problems with some international financial institutions' programs to build Chad's institutional capacity. Domestic and foreign monitoring organizations noted several physical or social problems associated with the oilfield development and potential flaws in the Government's Oil Revenue Management System.

The expected income from the initial production from the Doba Basin oilfields has been enhanced by higher-than-projected prices for crude oil in 2004. As a result of the successful oilfield development and the general trend of rising international mineral commodity prices in 2004, the Ministère des Mines et de l'Énergie has proposed to resume vigorous

promotion of the development of other mineral commodities and unleased petroleum prospects in Chad; although as oil development languished for years until the pipeline was built, the lack of transport may limit the development options for other minerals. High-value low-weight commodities, such as diamond and gold, would be more readily developed than base metals. Import substitution, such as the development of a cement plant, could enhance the feasibility of some processed mineral commodity projects. The proposed Farcha oil refinery could reduce some of the country's dependence on imported asphalt and refined petroleum products and provide fuel for electricity generation in N'Djamena.

The crude oil export pipeline was designed with some excess capacity for additional oilfield development. Originally, potential production from the Permit H concession was projected to be used to top off the pipeline, but the excess capacity also could be filled with early production from the Moundouli and the Nya projects, and base capacity, used for a longer-than-expected period with the output from the Bolobo, the Komé, and the Miandoum Fields. Current (2004) capacity constraints could be circumvented with the addition of supplemental pumping stations that would increase the pipeline's throughput if the EnCana or the Energem concessions are successfully developed.

Potential mineral industry development could be negatively impacted by the social instability in eastern Chad that was associated with the military action in the Darfur region of Sudan and exploration activity in Chad could be adversely affected by the continued unrest in the north and leftover antipersonnel and antitank land mines in the Borkou-Ennedi-Tibesti, the Guera, the Moyen Chari, and the Salamat regions.

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Major Sources of Information

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TABLE 1
CHAD: ESTIMATED PRODUCTION OF MINERAL COMMODITIES^{1,2}

(Thousand metric tons unless otherwise specified)

Commodity ³	2000	2001	2002	2003	2004
Aggregate, sand, and stone	300	500	500	300	300
Gold, mine output, Au content kilograms	120	150	150	150	150
Natron (soda ash)	12	12	12	12	12
Petroleum, crude thousand 42-gallon barrels	--	--	--	8,600 ⁴	61,400 ⁴
Salt	9	9	9	9	9

¹Revised. -- Zero.

²Includes data available through May 13, 2005.

³Estimated data are rounded to no more than three significant digits.

⁴In addition to the commodities listed, other industrial minerals and construction materials (clay, lime, and limestone) are produced, but information is inadequate to make reliable estimates of output.

⁴Reported figure. Production volume was metered on the floating, storage, and offloading vessel offshore Kribi, Cameroon.

TABLE 2
CHAD: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Clay	Various local operators	Various locations	NA
Gold kilograms	Artisanal placer operations	Mayo Dala Department	150
Lime	Various local operators	Various locations	NA
Limestone	Société d'Exploitation Minière de Pala	Louga quarry	NA
Petroleum, crude 42-gallon barrels per day	Esso Exploration and Production Chad Inc. (Exxon Mobil Corp., 40%; Petronas Carigali Overseas Sdh. Bhd., 35%; Chevron Overseas Petroleum Inc., 25%)	Bolobo, Kome, and Miandoum Fields, Doba Basin	217,000 ¹
Salt	Various local operators	Various locations	9,000
Sand and gravel	do.	Chari and Logone Rivers	300,000
Soda ash	do.	Lake Chad, near Liwa	12,000
Stone, crushed	Société Tchadienne d'Exploitation des Carrières	Mani quarry, Dandi	NA

NA Not available.

¹Expected to reach 225,000 barrels per day by 2005.