



2010 Minerals Yearbook

AFRICA

THE MINERAL INDUSTRIES OF AFRICA

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The 56 independent nations and other territories of continental Africa and adjacent islands covered in this volume encompass a land area of 30.3 million square kilometers, which is more than three times the size of the United States, and were home to 1.03 billion people in 2010. Nigeria had a population of 158 million in 2010; Ethiopia, 83 million; Egypt, 81.1 million; Democratic Republic of the Congo [Congo (Kinshasa)], 66 million; and Sudan, 51.6 million (table 1). For many of these countries, mineral exploration and production constitute significant parts of their economies and remain keys to future economic growth. Africa is richly endowed with mineral reserves and ranks first or second in quantity of world reserves of bauxite, chromite, cobalt, industrial diamond, manganese, phosphate rock, platinum-group metals (PGM), soda ash, vermiculite, and zirconium (Bray, 2011; Corathers, 2011; Gambogi, 2011; Jasinski, 2011; Kostick, 2011; Loferski, 2011; Olson, 2011; Papp, 2011; Shedd, 2011; Tanner, 2011).

The mineral industry was an important source of export earnings for many African nations in 2010. To promote exports, groups of African countries have formed numerous trade blocs, which included the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC), the Economic Community of Central African States, the Economic Community of West African States, the Mano River Union, the Southern African Development Community (SADC), and the West African Economic and Monetary Union. Algeria, Angola, Libya, and Nigeria were members of the Organization of the Petroleum Exporting Countries (OPEC). The African Union, which had 53 African countries as members, was formed to accelerate socioeconomic integration and promote peace, security, and stability on the continent.

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For mineral production statistics—

- Algeria—Ministry of Energy and Mines,
- Egypt—Ministry of Petroleum,
- Ethiopia—Ministry of Mines and Energy,
- Gambia—Geological Department,
- Ghana—Minerals Commission,
- Mauritania—National Office of Statistics,
- Mauritius—Central Statistics Office,
- Morocco—Department of Energy and Mines and Directorate of Statistics,
- Namibia—Ministry of Mines and Energy,
- Niger—Ministry of Energy and Mines,
- Seychelles—Seychelles Energy Commission,
- South Africa—Department of Mineral Resources,

- Sudan—Geological Research Authority of Sudan,
 - Swaziland—Central Statistical Office,
 - Tanzania—Ministry of Energy and Minerals, and
 - Uganda—Department of Geological Survey and Mines.
- For basic economic data—the International Monetary Fund.
For mineral consumption data—
- BP p.l.c.,
 - Department of Minerals and Energy of the Republic of South Africa, and
 - International Iron and Steel Institute.
- For exploration and other mineral-related information—
Metals Economics Group (MEG) in Canada.

General Economic Conditions

In 2010, the real gross domestic product (GDP) of sub-Saharan Africa increased by 5.4%, which represented substantial improvement from the growth rate of 2.8% in 2009 during the worldwide economic crisis. The GDP also increased in Egypt by 5.1% in 2010; Libya, 4.2%; Morocco, 3.7%; Algeria, 3.3%; and Tunisia, 3.1%. The worldwide GDP increased by 5.1% in 2010 after decreasing by 0.7% in 2009 (table 2). The average GDP growth rate in petroleum-exporting countries was 7.3%; in low-income petroleum-importing countries, 5.8%; and middle-income petroleum-importing countries, 3.1% (International Monetary Fund, 2011, p. 95, 185).

GDP growth in African petroleum-exporting countries was projected to be at or about 6% in 2011 and 7.2% in 2012. In low-income petroleum-importing countries, GDP growth was expected to be at or about 5.9% in 2011 and 6.5% in 2012. Low-income petroleum-importing countries were not well integrated into the global financial system and were not severely affected by the worldwide economic crisis of 2008–9. GDP growth is likely to be at or about 3.5% in 2011 and 3.7% in 2012 in middle-income petroleum-importing countries, which were more integrated into global markets and were more severely affected by the crisis. In Sierra Leone, the outlook is for an increase of 5.1% in the GDP in 2011 and 51.4% in 2012 because of the development of iron ore mines. Niger's GDP is expected to increase by 5.5% in 2011 and 12.5% in 2012 because of increased uranium production (International Monetary Fund, 2011, p. 93–95, 185).

Investment Data

In South Africa, numerous producers planned new mines and plants and capacity expansions of existing operations for andalusite, cement, chromite, coal, diamond, ferrochromium, ferromanganese, fluorspar, gold, iron ore, manganese ore, nickel, PGM, rare-earth elements, uranium, and wollastonite. The estimated capital costs of the new Styldrift PGM mine amounted

to \$1.54 billion; the new Kolomela iron ore mine, \$1.06 billion; the expansion of the Khumani iron ore mine, \$880 million; the new Cooke Dam gold-uranium project, \$528 million; the new Western Bushveld joint-venture PGM project, \$433 million; the new Tshipi Borwa manganese mine, nearly \$200 million; and the new Kalplats PGM mine, \$186 million.

Elsewhere, capital expenditure for the Ambatovy nickel mine in Madagascar was expected to total \$4.76 billion by 2013. The capital costs of the Moatize coal mine in Mozambique were estimated to be \$1.4 billion. In Sierra Leone, the capital expenditures for the first phase of the Tonkolili iron ore project were estimated to be \$1.2 billion. In Congo (Kinshasa), the estimated capital costs of the Twangiza gold mine were \$511 million. Capital expenditures for the Koka Mine in Eritrea were estimated to be \$122 million.

Chinese companies planned substantial investment in African mining projects and related infrastructure. Bellzone Mining plc of Australia signed a joint-venture agreement with China International Fund Ltd. to develop and fund the estimated \$2.7 billion port, railway line, and associated infrastructure for the Kalia iron ore project in Guinea. Rio Tinto plc of the United Kingdom signed a joint-venture agreement with Aluminum Corp. of China (Chinalco) for the development of iron ore deposits in Guinea; Chinalco planned to invest \$1.35 billion in the project. China Railways Materials Commercial Corp. invested \$247 million in African Minerals Ltd., which held 100% ownership in the Tonkolili project.

Legislation

In 2010, the Government of Tanzania passed the Mining Act of 2010, which increased royalties on gold and base metals to 4% from 3%, and on rough diamond and colored gemstones, to 6% from 5%. Royalties on uranium were set at 7% and other minerals, at 3%. The new legislation also required companies to list domestically, allowed the Government to take a share in future mining projects, and restricted foreign participation in small-scale mining (Mining Journal, 2010; Thompson, 2010).

The South African Government's Black Economic Empowerment program required that black ownership of mining companies reach 26% by 2014. In September 2010, the Government introduced its new Mining Charter, which allowed companies to use the value of their domestic beneficiation activities as credit for up to 11% of their black ownership requirements. The new Mining Charter required mining companies to purchase 70% of their services, 50% of their consumable goods, and 40% of their capital goods from Black Economic Empowerment entities by 2014. Companies were also required to report progress annually on development of near-mine communities, sustainable growth and development, and beneficiation (Creamer, 2010).

In September 2010, the Government of Congo (Kinshasa) suspended mining in the eastern Provinces of Maniema, Nord-Kivu, and Sud-Kivu, which accounted for most domestic niobium, tantalum, tin, and tungsten production. The suspension remained in effect at the end of 2010. The Government imposed the ban in an attempt to remove military and rebel groups from the local mineral trade. In October 2009, the Government

of Katanga Province imposed a tax of \$5 per kilogram on shipments of cassiterite and its coproducts to other Provinces. In April 2010, the national Government imposed a \$60 per metric ton tax on the export of unprocessed copper and cobalt ore to encourage domestic copper and cobalt beneficiation (Metal Bulletin, 2010; Spittaels and Caesens, 2010; De Koning, 2011, p. 30).

The Government also launched military operations in 2010 to take control of mines in eastern Congo (Kinshasa) from the Forces Démocratiques pour la Libération du Rwanda (FDLR) and the Mai-Mai militia. In Sud-Kivu Province, the Government succeeded in removing FDLR and Mai-Mai forces from mining areas in the Fizi, Kalehe, Mwenga, and Shabunda Territories. By the end of 2010, the majority of the mineral trade in eastern Congo (Kinshasa) was under the control of Congolese military units; however, the FDLR and Mai-Mai still controlled some mines and engaged in retaliatory attacks. Most of the military units in control of the mines were former rebels from the Congres National pour la Défense du Peuple (CNDP) and were poorly integrated into the national army (Global Witness, 2010, p. 7, 10; De Koning, 2011, p. 18).

In July 2010, the U.S. Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act, which contains provisions concerning the use of minerals to finance military operations in eastern Congo (Kinshasa). All companies registered with the U.S. Securities and Exchange Commission (SEC) that sell products containing cassiterite, columbite-tantalite, gold, or wolframite are required to disclose whether these minerals originated from Congo (Kinshasa) or adjoining countries. Companies that sell products containing cassiterite, columbite-tantalite, gold, or wolframite that originated in Congo (Kinshasa) or adjoining countries are required to submit annual reports to the SEC describing the due diligence measures taken, the smelters that processed the minerals, and the companies' efforts to determine the mine of origin. The reports also are required to describe products that contain conflict minerals and to be published on the companies' Web sites (Global Witness, 2010, p. 21).

The Government of Rwanda signed an agreement with the International Tin Research Institute of the United Kingdom to implement a certification scheme for domestically produced tantalum, tin, and tungsten to meet end users' requirements of the Dodd-Frank Wall Street Reform and Consumer Protection Act. The Government planned to tag 100% of domestically produced tantalum, tin, and tungsten by March 2011 (International Tin Research Institute, 2010).

A new constitution was approved for Angola in July 2010, which requires foreign investors to have an Angolan company as a partner. After a period of mining inactivity as a result of recent unrest in Niger, a review of mining permits was undertaken for the purpose of reestablishing the industry. Of the 158 exploration permits under review in Niger, 130 were related to uranium. Zimbabwe continued its reevaluation of mining contracts and implementation policies related to the nation's mining law enacted during 2009, which requires 51% indigenous ownership (Faurie, 2010; Thomson Reuters, 2010b; Mining Journal, 2011).

Exploration

Exploration activity in Africa, as defined by African exploration budgets reported by the MEG, increased by 27% to about \$1.4 billion in 2010 from about \$1.1 billion in 2009. African exploration activity accounted for about 13% of the total worldwide exploration budget. In 2010, the principal mineral commodities of interest in Africa were, in descending order of budget allocation, gold, PGM, diamond, copper, uranium, and base metals (Wilburn, Vasil, and Nolting, 2011).

Exploration was focused primarily in (in order of the number of sites being actively explored) South Africa, Burkina Faso, Ghana, Congo (Kinshasa), Namibia, Tanzania, Botswana, Mali, and Zambia. Gold targets accounted for approximately 41% of reported African exploration projects; PGM, about 15%; copper, about 12%; uranium, about 9%; iron ore, about 7%; diamond, about 5%; and other minerals, about 11%. Based on the number of active exploration sites, early-stage projects composed about 47% of the activity in 2010, whereas producing projects accounted for about 27%; feasibility stage projects, about 15%; and developing projects, about 11% (Wilburn, Vasil, and Nolting, 2011).

Although mineral exploration activity in Africa has increased, the average budgeted exploration expenditure at many individual sites was at a lower level than in other regions. When compared with such areas as Latin America and the United States, much of Africa was at a comparatively early stage of development, and much of African exploration was focused on identifying new areas rather than expanding the resources of previously identified areas. The increase in the number of active exploration sites in 2010 can be explained by the resurgence in activity at sites temporarily suspended in 2009 because of the downturn in the global economy.

Exploration activity in Africa in 2010 varied as increases in commodity prices and renewed investor interest stimulated activity in some areas, although mineral supply concerns related to electricity shortages and regional unrest limited activity in other areas. Power costs have become a matter of increasing concern in South Africa, and power tariffs are set to increase for the next 3 years by about 25% annually. Australian companies are reported to have committed a record \$18.3 billion in the African resources sector in 2010, and were involved with nearly 500 mines and exploration projects in 40 African countries. Canadian mining and exploration investment in Africa for 2010 was reported to be lower than for 2009, although no specific statistics were yet available. Chinese investment in Africa was also expected to decline in 2010 from the record 2009 level because of an uncertain economic outlook in the region. Russian investors designated \$1 billion for short-term uranium exploration and development in Namibia to supply a powerplant currently under construction in Turkey with Russian financing. Indian-owned companies have expressed interest in investing in coal and gold exploration projects in South Africa (Swanepoel, 2010; Thomson Reuters, 2010a; Mining Journal, 2011; Net Indian News Network, 2011).

Commodity Overview

In tables 5 through 19, estimates for the production of major mineral commodities for 2013 and beyond have been based upon supply-side assumptions, such as announced plans for increased production/new capacity construction and bankable feasibility studies. The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2010) producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated timeframes. Forward-looking information, which includes estimates of future production, exploration and mine development, cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will take place.

Metals

Aluminum and Bauxite and Alumina.—Production.—African bauxite production increased by nearly 13% in 2010. In Guinea, production increased at the Debele, the Friguia, the Kamsar, and the Sangaredi Mines. Output increased at the Sierra Minerals Mine in Sierra Leone. Guinea accounted for about 90% of African bauxite production; Sierra Leone, 6%; and Ghana, 3% (table 5). In 2010, Africa's share of world bauxite production was 8% (table 4).

African production of refined aluminum remained nearly unchanged. Production increased at the Mozal smelter in Mozambique and the Ikot Abasi smelter in Nigeria and decreased in Cameroon. South Africa accounted for about 44% of African aluminum output; Mozambique, 30%; and Egypt, 22% (table 6). Africa accounted for 4% of the world's aluminum production in 2010 (table 4).

Outlook.—African bauxite production is likely to increase by an average of nearly 17% per year from 2010 to 2017. Increased production in Guinea could be attributable to new mines at Boffa in 2015 and Sangaredi in 2017. In Sierra Leone, the Porto Loko Mine could open in 2015. The expansion of the Awaso Mine in Ghana is scheduled for 2014 (table 5).

The production of refined aluminum is expected to increase by an average of between 5% and 6% per year from 2010 to 2017. In Ghana, most of the increase is likely to be attributable to the reopening of the Valco smelter in 2011 and the opening of a new smelter in 2014. Output is likely to increase at the Nag Hammadi smelter in Egypt and the Ikot Abasi smelter in Nigeria by 2015 (table 6).

Cobalt.—Production.—In 2010, African cobalt mine production increased by about 42% compared with that of 2009. Increased production in Congo (Kinshasa) was broadly based,

with output increasing at the Etoile, the KOV, the KTO, the Luiswishi, the Mutanda, the Mukondo Mountain, the Ruashi, the T17, and the Tenke Fungurume copper-cobalt mines. In Morocco, output nearly doubled at the Bou-Azzer Mine in 2010. The Ambatovy nickel-cobalt mine opened in Madagascar. Production also increased in Zambia. In 2010, Congo (Kinshasa) accounted for 86% of African cobalt mine production; Zambia, 8%; and Morocco, 4% (table 7). Africa's share of world cobalt mine production was 70% in 2010 (table 4).

Outlook.—African cobalt mine production is expected to increase by an average of about 9% per year from 2010 to 2017. Congo (Kinshasa) is likely to account for most of the increase in output because of the expansion of the Etoile Mine from 2011 to 2012; the Kinsevere Mine, from 2011 to 2013; the Mutanda Mine, from 2011 to 2015; the Tenke Fungurume Mine, from 2011 to 2016; and the KOV, the KTO, the Mukondo Mountain, and the T17 Mines, from 2011 to 2017. In Madagascar, the Ambatovy Mine could reach full capacity in 2013. The Nkomati Mine is expected to reach full production in South Africa by mid-2012. In Tanzania, the Dutwa nickel-cobalt mine is likely to open in the first quarter of 2015 (table 7).

Copper.—**Production.**—Africa's copper mine production increased by about 13% in 2010 compared with that of 2009. In 2010, Zambia accounted for 56% of African copper mine production; Congo (Kinshasa), 30%; and South Africa, 7% (table 8). Africa's share of world copper mine production was 9% in 2010 (table 4). In Zambia, output increased at the Kansanshi and the Lumwana Mines. The production increase in Congo (Kinshasa) was attributable to the Etoile, the KOV, the KTO, the Luiswishi, the Mutanda, the Mukondo Mountain, the Ruashi, the T17, and the Tenke Fungurume Mines. The Frontier Mine was shut down in 2010. In South Africa, output decreased at the Palabora Mine.

Africa's refined copper production increased by 26% from 2009 to 2010. In 2010, Zambia accounted for 60% of African refined copper production; Congo (Kinshasa), 30%; and South Africa, 9% (table 9). Zambia's output increased because of the expansion of the Nkana refinery and the reopening of the Bwana Mkubwa solvent extraction-electrowinning (SX/EW) plant. In Congo (Kinshasa), production increased at the Luilu, the Luita, the Ruashi, the Tenke Fungurume, and the Usoke Avenue SX/EW plants. Decreased output in South Africa was mostly attributable to reduced output from the Palabora refinery. Egypt was the only producer of secondary refined copper in Africa; primary production accounted for most African production.

Consumption.—In 2009, world refined copper consumption increased by about 1% to 18.2 million metric tons (Mt). Africa's share of global copper consumption amounted to about 2% in 2009. South Africa's consumption remained unchanged at 68,000 t in 2009 (Chili, 2010).

Outlook.—African copper mine production is expected to increase by an average of about 10% per year from 2010 to 2017. Zambia's output is likely to increase because of the opening of the Konkola North and the Mulyashi Mines and the expansion of the Kansanshi, the Konkola, and the Lumwana Mines. In Congo (Kinshasa), the Kipoi Mine is planned to open in 2011, and the Kapulo Mine is planned to open in 2012. Increased production is also expected from the expansion of

the Etoile Mine from 2011 to 2012; the Kinsevere Mine, from 2011 to 2013; the Mutanda Mine, from 2011 to 2015; the Tenke Fungurume Mine, from 2011 to 2016; and the KOV, the KTO, the Mukondo Mountain, and the T17 Mines, from 2011 to 2017 (table 8).

Nevsun Resources Ltd. plans to mine from a copper-rich zone at the Bisha Mine in Eritrea from 2013 to mid-2016. South Africa's production is expected to increase because of the expansion of the Nkomati nickel mine by 2012. In Sudan, the Hassai VMS project is likely to start in 2015 (table 8).

The production of refined copper is expected to increase by an average of about 9% per year from 2010 to 2017. In Congo (Kinshasa), new SX/EW plants are likely to open at Kinsevere and Mutanda in 2011 and at Kipoi in 2014. Increased production is also expected from the expansion of the Usoke Avenue plant from 2011 to 2013; the Luilu and the Luita plants from 2011 to 2017; and the Tenke Fungurume plant, in 2013. Congo (Kinshasa), which did not produce refined copper in 2005, could account for 56% of the continent's refined copper output by 2017. Zambia's output is likely to increase because of the opening of the Chambishi SX/EW plant (table 9).

Gold.—**Production.**—Africa's gold mine production was about 479,000 kilograms (kg) in 2010, which was an increase of about 2% compared with that of 2009. Production decreased significantly since 2000 because of the long-term decline in South African production that more than offset the increased output in Burkina Faso, Mali, Sudan, and Tanzania (table 10). In 2010, Africa's share of world gold mine production was about 22% (table 4).

Burkina Faso's production rose because of increased output from the Inata, the Kalsala, the Mana, the Taparko-Borum, and the Youga Mines and the opening of the Essakane Mine. Egypt's Sukari Mine, which opened in late 2009, had its first full year of production in 2010. Artisanal gold mining increased in Kenya and Sudan. Gold output also increased in Zimbabwe. In late 2010, mining started at a gold-rich zone in the Bisha polymetallic deposit in Eritrea.

In 2010, the decline in South Africa's production was attributable to the Beatrix, the Driefontein, the Great Noligwa, the Kloof, the Kopanang, the Tshepong, and the Virginia Mines. Production increased at the Doornkop, the Modder East, the Phakisa, and the Target Mines. The Burnstone Mine opened in late 2010. In Mali, decreased output at the Kalana, the Loulo, the Morila, the Sadiola Hill, and the Yatela Mines more than offset increased output from the Syama and the Tabakoto Mines. The decrease in Guinea's production was partially attributable to the Siguiri Mine. In Côte d'Ivoire, decreased production from the Bonikro and the Ity Mines more than offset the opening of the Tongon Mine. Output also decreased in Guinea (table 10).

In 2010, South Africa accounted for 39% of African gold production; Ghana, 16%; Mali and Tanzania, 8% each; and Burkina Faso and Sudan, 5% each. South Africa's share of continental gold production decreased from 71% in 2000 because of rising production costs associated with deeper underground operations and increased production in Burkina Faso, Mali, Sudan, and Tanzania (table 10).

Outlook.—Gold mine production in Africa is expected to increase by an average of about 6% per year from 2010 to 2017.

The majority of the increase is likely to be attributable to countries in West Africa, particularly. Mauritania's production is expected to increase sharply by 2015 because of the expansion of the Tasiast Mine. In Ghana, the outlook is for an increase in output from the Chirano Mine by 2013 and the Bogosu/Prestea, the Iduapriem/Teberebie, the Prestea, and the Tarkwa Mines by 2015. The opening of the Nzema Mine in 2011 and the Akyem Mine in late 2013 and the reopening of the Konongo Mine in late 2012 are also expected to contribute to increased production. Burkina Faso's production is likely to increase because of the opening of the Somita and the Bissa Mines in 2013 and 2015, respectively, and the expansion of the Mana Mine by 2015 and the Essakane and the Inata Mines by 2017 (table 10).

Gold production is also expected to increase in other West African countries, including Côte d'Ivoire, Guinea, Mali, and Senegal. The outlook for Senegal is for increased output because of the opening of the OJVG Mine by 2013 and the Masawa Mine by 2015 and the expansion of the Sabodala Mine by 2017. In Côte d'Ivoire, production is likely to increase at the Angovia, the Bonikro, the Ity, and the Tongon Mines. In Mali, output is expected to increase at the Loulo, the Sadiola, and the Syama Mines, and the Goukoto Mine is planned to open by 2013. By 2017, Mali's production is likely to start declining. The Kourousa Mine could open in Guinea by 2015 (table 10).

In East Africa, Tanzania's production is likely to increase with the opening of the Gold Plateau and the Luika Mines in 2011 and the Golden Ridge Mine in 2013. The expansion of the Geita Mine is expected to be completed in 2011, and that of the Bulyanhulu and the North Mara Mines, in 2014. Other new sources of production could include the Nyazanga project. The Tulawaka and the Golden Pride Mines were likely to shut down in 2013. In Ethiopia, increased production is likely to be attributable to artisanal miners and the opening of the Sakaro and the Tulu Kapi Mines in 2012 and late 2014, respectively. The Lega Dembi open pit mine is scheduled to shut down in 2014. Gold-rich zones in the Bisha Mine in Eritrea are planned to be mined in 2011 and 2012; production at Bisha is expected to decline from 2012 to 2017 as mining shifts to a copper-rich zone. The Koka Mine is also likely to open in late 2013 (table 10).

In southern Africa, the long-term decline in South Africa's production could be reversed from 2010 to 2015. The expansion of the Burnstone, the Kusasalethu, the Moab Khotson, the Modder East, and the Phakisa Mines could be completed in 2013; the Cooke and the South Deep Mines, in 2014; and the Doornkop Mine, in 2015. National output is likely to decline starting in 2016. Production could also increase in Zimbabwe (table 10).

Sudan's output is expected to increase until the Hassai Mine starts an expansion in 2013 and reaches its peak production in 2015. In Egypt, production is likely to increase at the Sukari Mine by 2013 (table 10).

Several African countries that had only artisanal gold production in 2010 are likely to open large-scale gold mines in the near future. In Congo (Kinshasa), the Twangiza Mine could open in late 2011; the Namoya Mine, in 2013; and the Kibali Mine, in early 2014. Other new mines opening include the

Passendro Mine in the Central African Republic by 2013 and the Boamahun and the Komahun Mines in Sierra Leone by 2015 (table 10).

Iron and Steel.—Production.—African production of crude steel increased by about 14% in 2010 compared with that of 2009. Output increased in Algeria, Egypt, South Africa, and Tunisia and decreased in Libya, Morocco, and Nigeria. South Africa accounted for 47% of regional crude steel production; Egypt, 37%; Libya, 5%; and Algeria, 4% (table 12). Africa's share of world crude steel production amounted to 1% in 2010 (table 4).

Consumption.—In 2010, world finished steel consumption increased to 1.39 billion metric tons (Gt) from 1.22 Gt in 2009. African crude steel consumption decreased to 29.6 Mt in 2010 from 33.3 Mt in 2009. Egypt accounted for 33% of African crude steel consumption; Algeria, 16%; Libya and Morocco, 6% each; and Nigeria, 5% (World Steel Association 2011, p. 89–90).

Outlook.—Crude steel production is expected to increase by an average of about 4% per year from 2010 to 2017. Nigeria could more than double its production with the reopening of the Ajaokuta plant. Steel production is likely to start in Tanzania with the opening of the Liganga iron ore mine by 2015. New steel plants are likely to reach full production in Kenya by 2017. Production could increase in Zimbabwe from 2013 to 2017 as Zimbabwe Iron and Steel Co. restores its capacity. Output is also expected to increase in Algeria, Egypt, and Tunisia (table 12).

Iron Ore.—Production.—In 2010, the iron content of ore produced in Africa was 45.4 Mt. Increased production in South Africa was attributable to the Khumani, the Mapochs, the Palabora, and the Sishen Mines; output decreased at the Beeshoek and the Thabazimbi Mines. Production also increased in Algeria, Egypt, and Mauritania. South Africa was the leading iron ore producer in Africa and accounted for 81% of continental output; Mauritania, 16%; and Algeria, 2% (table 11).

Outlook.—The iron content of ore produced in Africa is expected to increase to about 212 Mt in 2017. Most of the increase is likely to be attributable to countries in West Africa. In Guinea, new mines are expected to start near Simandou, with operations starting in Blocks 1 and 2 in 2013 and at Blocks 3 and 4 in 2015. The Forecariah Mine could start in 2013; the Kalia Mine, in 2015; and the Mount Nimba Mine, in 2017. Iron ore production is likely to start at the Kango Mine in Gabon in 2013. Sierra Leone is expected to become Africa's fourth-ranked iron ore producer with the opening of the Marampa Mine in 2011 and the Tonkolili Mine in 2013. The expansions of the Guleb el Rhein, the Kedia d'Idjill, and the M'Haoudat Mines in Mauritania are planned to be completed by 2014. In Senegal, the Faleme Mine could start up by 2017 (table 11).

In South Africa, the expansion of the Kolomela Mine is likely to be completed by mid-2012; increased production is also planned at the Sishen Mine starting in 2015. The Kolomela Mine is expected to start production in 2012. Iron ore mining is likely to start at the Tete project in Mozambique in 2014 and at the Liganga Mine in Tanzania in 2015. Production could also start in Kenya in 2014 and restart in Zimbabwe by 2015 (table 11).

Guinea, Gabon, and Sierra Leone did not produce iron ore in 2010; their shares of African iron ore production by 2017

are expected to be 56%, 6%, and 5%, respectively. South Africa's share is likely to decline to 23% from 81% in spite of a substantial increase in domestic production (table 11).

Platinum-Group Metals.—Production.—From 2009 to 2010, Africa's production of palladium and platinum increased by 10% and 6%, respectively. In South Africa, increased palladium and platinum production in 2010 was attributable to the Batholope, the Dishaba, the Thembelani, the Kroondal, the Marikana, the Mogalakwena, the Mototolo, the Nkomati, the Pilanesburg, the Tumela, the Two Rivers, and the Union Mines. Output decreased at the Eland, the Impala, and the Zondereinde Mines. PGM production increased at the Mimosa Mine in Zimbabwe. South Africa, which was the continent's dominant producer of PGM, accounted for 94% and 92% of the production of platinum and palladium, respectively (tables 13, 14).

Outlook.—African mine production of palladium and platinum is expected to increase by an average of 4% per year each from 2010 to 2017. In South Africa, the increase is likely to be broad based, with most producers planning expansions. The opening of the Kalahari and the Maresburg Mines is planned for 2012; the Booyesdal and the Rooderport Mines and the Western Bushveld joint venture, for 2013; and the Styldrift Mine, for 2017. The expansions of the Everest, the Nkomati, the Pilanesburg, and the Two Rivers Mines are expected in 2012; the Crocodile River, the Marikana, and the Marula Mines, in 2013; the Impala Mine, in 2014; the Eland Mine, by the end of 2015; and the Bokoni Mine, in 2016. Output in Zimbabwe could also increase (tables 13, 14).

Tin.—Production.—In 2010, African tin mine production decreased by about 29% compared with that of 2009. Output decreased at artisanal and small-scale mining operations in Congo (Kinshasa) and increased in Rwanda. In 2010, Congo (Kinshasa) accounted for 80% of African tin mine production, and Rwanda, 18% (table 15).

Africa did not produce refined tin in 2010 (table 16). Reported production of tin metal ceased in Nigeria and Rwanda in 2005 and 2006, respectively.

Outlook.—African tin mine production is expected to decrease by about 8% by 2013 because of decreases in artisanal and small-scale mining operations in Congo (Kinshasa). The suspension of mining in Nord-Kivu and Sud-Kivu Provinces remained in effect at the end of 2010. It is unclear whether sufficient markets could be found for minerals produced in Nord-Kivu and Sud-Kivu Provinces when the suspension is lifted because of concerns about conflict minerals. Provisions of the Dodd-Frank Wall Street Reform and Consumer Protection Act could also affect demand for Congolese tin. The Abu Dabbab tin and tantalum mine in Egypt is likely to open by 2013. African countries are unlikely to open new tin refineries by 2017 because of high energy costs (tables 15, 16).

Industrial Minerals

Diamond.—Production.—In 2010, Africa's share of world diamond production, by volume, was 57% (table 4). African diamond production increased by about 19% in 2010 compared with that of 2009. In Botswana, production increased at the Jwaneng, the Letlhakane, and the Oropa Mines; the

Damtshaa Mine shut down. In South Africa, increased output was attributable to the Finsch, the Kimberley Surface, the Venetia, and the Voorspoed Mines. The Namaqualand Mine shut down in 2010. Production also increased in Namibia and Sierra Leone (table 17).

Diamond output decreased in Congo (Kinshasa) and Tanzania because of the shutdown of large-scale mining operations. Production also decreased in Angola, Central African Republic, and Guinea. Botswana accounted for 29% of African diamond output by volume; Congo (Kinshasa), 23%; Angola, 18%; and South Africa and Zimbabwe, 12% each. Large-scale mining operations were predominant in Angola, Botswana, Lesotho, Namibia, and South Africa (table 17).

In 2010, the global value of rough diamond production amounted to \$11.5 billion, of which Africa accounted for more than 52%. Botswana accounted for 25% of the value of global rough diamond output; Angola, 10%; Congo (Kinshasa) and South Africa, 6% each; and Namibia, 5%. The global value of polished diamond production amounted to \$19.7 billion, of which Botswana, Namibia, and South Africa combined accounted for nearly 9% (Even-Zohar, 2011).

The Kimberley Process Certification Scheme (KPCS) was established to reduce the trade in conflict diamond, particularly diamond originating from Angola, Congo (Kinshasa), and Sierra Leone. The establishment of the KPCS involved Government officials from 75 countries that produced, processed, and imported diamond as well as representatives from the European Union, the World Diamond Council, and nongovernmental organizations. As of December 2010, the following African countries had met the minimum requirements of the KPCS: Angola, Botswana, Central African Republic, Congo (Brazzaville), Congo (Kinshasa), Ghana, Guinea, Lesotho, Liberia, Mauritius, Namibia, Sierra Leone, South Africa, Tanzania, Togo, and Zimbabwe.

On October 15, 2010, the United Nations renewed once again the ban on rough diamond trade that it had imposed on Côte d'Ivoire since 2005. The measure was to be reviewed again on April 30, 2011. Reported human rights violations in and around the Marange diamond fields led to disputes regarding Zimbabwe's membership in the KPCS (Human Rights Watch, 2010; United Nations Security Council, 2010).

Outlook.—The production of rough diamond in Africa is expected to increase by an average of nearly 2% per year from 2010 to 2017, with output increasing by more than 1.5 million carats per year each in Botswana, Congo (Kinshasa), and Zimbabwe. Botswana is likely to account for most of the increase because of the opening of the AK6, the BK11, and the Gopa Mines and the reopening of the Damtshaa Mine. Artisanal and small-scale diamond mining is expected to increase in Congo (Kinshasa). Production is expected to rise at Marengé in Zimbabwe from 2010 to 2015 and to start declining by 2017; increases in output at Marengé could depend on the outcome of disputes regarding Zimbabwe's membership in the KPCS (table 17).

In Tanzania, the Williamson Mine is likely to reopen at higher levels of production in 2011. In South Africa, production is expected to decrease from 2010 to 2015 because of decreased output at the Kimberley Surface and the Venetia Mines.

By 2017, output is likely to exceed the levels reached in 2010 because of the expansions of the Cullinan, the Finsch, the Kimberley Underground, the Koffiefontein, and the Voorspoed Mines. Ghana's large-scale mining operations could restart by 2015. Namibia's production is also expected to increase. In Angola, output is likely to decrease substantially in part because of the suspension of production at the the Fucauma and the Luarica projects (table 17).

Lithium.—*Production.*—Zimbabwe was Africa's only producer of lithium minerals. In 2010, production decreased by about 53% (table 18).

Outlook.—Zimbabwe's lithium mineral production is likely to increase from 2010 to 2013 and then remain stable (table 18).

Mineral Fuels

Coal.—*Production.*—African coal production increased by nearly 2% in 2010. In South Africa, increased output was partially attributable to increased production at the Mafube and the Matla Mines and the opening of the Zibulo Mine. Output increased in Botswana and Zimbabwe. South Africa, which was the dominant coal producer in Africa, accounted for 98% of regional coal output; and Zimbabwe, 1% (table 19). More than 99% of South Africa's coal production was bituminous. Africa accounted for about 4% of total world anthracite and bituminous coal production in 2010 (table 4).

Consumption.—Africa accounted for about 3% of world coal consumption in 2010. Within the region, South Africa accounted for 93% of African coal consumption. From 2005 to 2010, Africa's consumption of coal increased by about 3% (BP p.l.c., 2011, p. 33).

Outlook.—African coal production is expected to increase by between 6% and 7% per year from 2010 to 2017. South Africa is likely to be responsible for the majority of the increase; its production could increase to 351 Mt by 2017 (table 19). Increased output would be attributable to the opening of the ATCOM East, the De Wittekrans, and the Dorsfontein East Mines in 2011; the Brakfontein, the Kangala, the New Largo, the Roodekop, the Vele, and the Vlakplaats Mines in 2012; the Boikarabelo, the Elders Opencast, and the Wonderfontein Mines in 2013; the Belfast, the Mooifontein, and the Sterkfontein Mines in 2014; and the Thabametsi Mine in 2016. The expansions of the Optimum Mine in 2010, the Vanggatfontein Mine in 2011, the Grootegeluk Mine from 2012 to 2015, the Zibulo Mine by 2013, and the Tweefontein Mine in 2014 were also expected to contribute to increased production (table 19).

Mozambique is expected to become the second ranked coal producer in Africa with the expansion of the Chipanga XI Mine in early 2012 and the opening of the Benga and the Moatize Mines in late 2011 and the Zambeze Mine in 2015. Tanzania is likely to become the third ranked producer with the opening of the Ngaka Mine in late 2011 and the Mchuchuma Mine in 2014. In Zimbabwe, output could increase at Hwange Colliery by 2013. Zambia's production is likely to increase because of the restoration of capacity at the Maamba Mine by 2012. Coal mining is also expected to increase in Nigeria (table 19).

Trade Review and Outlook

Sub-Saharan Africa's current account deficit amounted to 1.2% of the GDP in 2010. Oil-exporting countries had an average current account surplus of 6% of the GDP. Middle-income oil-importing countries had an average current account deficit of 3.1% of the GDP, and low-income oil-importing countries, an average deficit of 6.3% of the GDP (International Monetary Fund, 2011, p. 95).

The average current account deficit for middle-income oil-importing countries is expected to be 3% of the GDP in 2011 and 3.8% of the GDP in 2012. For low-income oil-importing countries, the deficit is likely to be 7% of the GDP in 2011 and 2012. For oil-exporting countries, the surplus is predicted to be 11.1% of the GDP in 2011 and 8.6% of the GDP in 2012. Africa is expected to run a current account surplus of 0.6% of the GDP in 2011 and a deficit of 0.6% of the GDP in 2012 (International Monetary Fund, 2011, p. 95).

Africa's natural gas exporters included Algeria, which accounted for 49% of the continent's natural gas exports; Nigeria, 21%; Egypt, 13%; Libya, 9%; Equatorial Guinea, 5%; and Mozambique, 3%. Europe received 75% of African total natural gas exports; countries of the Asia and the Pacific region, 8%; and North America, 5%. Intra-regional exports to other Africa countries accounted for only 4% of total African natural gas exports (BP p.l.c., 2011, p. 28–29).

In 2010, Europe received 33% of Africa's petroleum exports; the United States, 29%; China, 17%; India, 7%; and other countries in the Asia and the Pacific region, 5%. West African countries sent 37% of their exports to the United States and 33% to China, India, and other countries in the Asia and the Pacific region. North African countries sent 59% of their exports to Europe and 20% to the United States. Intra-regional exports to African countries amounted to only 1% of total African petroleum exports (BP p.l.c., 2011, p. 18).

Intra-regional mineral trade was, however, significant for gold. South Africa imported gold, mostly from West African countries, to supply its gold refinery. A majority of African gold mine production was refined in South Africa before being exported to other regions. Most of Africa's copper and PGM production was also exported in refined form. The majority of Africa's chromite production was processed into ferrochromium prior to export. For other commodities, which included bauxite, colored gemstones, diamond, iron ore, manganese, niobium (columbium), petroleum, tantalum, tin, tungsten, and uranium, most or all of the continent's production was exported prior to downstream processing.

Environment

Deforestation for fuel use and land-intensive agricultural production continued to be a significant environmental issue in many African countries. Other causes of deforestation included artisanal production of bricks, gemstones, lime, and sand and gravel. The use of mercury by artisanal gold miners has led to serious air and water pollution in such African countries as Ghana, Kenya, Mozambique, South Africa, Sudan, Tanzania, and Zimbabwe. In South Africa, acid mine drainage from large-scale

gold mines in the Witswatersrand Mining Basin reportedly contaminated the Crocodile and the Vaal River systems with increased levels of heavy metals and radioactive particles. The flaring of natural gas in Nigeria has led to air pollution and emissions of greenhouse gases.

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TABLE 1
AFRICA: AREA AND POPULATION IN 2010

Country	Area ¹ (square kilometers)	Estimated population ² (thousands)
Algeria	2,381,741	35,468
Angola	1,246,700	19,082
Benin	112,622	8,850
Botswana	581,730	2,007
Burkina Faso	274,200	16,469
Burundi	27,830	8,383
Cameroon	475,440	19,599
Cape Verde	4,033	496
Central African Republic	622,984	4,401
Chad	1,284,000	11,227
Comoros	2,235	735
Congo (Brazzaville)	342,000	4,043
Congo (Kinshasha)	2,344,858	65,966
Côte d'Ivoire	322,463	19,738
Djibouti	23,200	889
Egypt	1,001,450	81,121
Equatorial Guinea	28,051	700
Eritrea	117,600	5,254
Ethiopia	1,104,300	82,950
Gabon	267,667	1,505
Gambia, The	11,295	1,728
Ghana	238,533	24,392
Guinea	245,857	9,982
Guinea-Bissau	36,125	1,515
Kenya	580,367	40,513
Lesotho	30,355	2,171
Liberia	111,369	3,994
Libya	1,759,540	6,355
Madagascar	587,041	20,714
Malawi	118,484	14,901
Mali	1,240,192	15,370
Mauritania	1,030,700	3,460
Mauritius	2,040	1,281
Mayotte	374	204
Morocco	446,550	31,951
Mozambique	799,380	23,391
Namibia	824,292	2,283
Niger	1,267,000	15,512
Nigeria	923,768	158,423
Reunion	2,517	NA
Rwanda	26,338	10,624
Sao Tome e Principe	964	165
Senegal	196,722	12,434
Seychelles	455	86
Sierra Leone	71,740	5,868
Somalia	637,657	9,331
South Africa	1,219,090	49,991
Sudan	2,505,813	51,631
Swaziland	17,364	1,186
Tanzania	947,300	44,841
Togo	56,785	6,028
Tunisia	163,610	10,549
Uganda	241,038	33,425

See footnotes at end of table.

TABLE 1—Continued
AFRICA: AREA AND POPULATION IN 2010

Country	Area ¹ (square kilometers)	Estimated population ² (thousands)
Western Sahara	266,000	NA
Zambia	752,618	12,926
Zimbabwe	390,757	12,571
Total	30,315,134	1,028,679
World	148,940,000	6,840,507

NA Not available.

¹Source: Central Intelligence Agency, The World Factbook 2011.

²Source: The World Bank, 2010 World Development Indicators Database.

TABLE 2
AFRICA: GROSS DOMESTIC PRODUCT^{1,2}

Country	Gross domestic product based on purchasing power parity		Real gross domestic product growth rate (percentage)		
	Gross value (billion dollars)	Per capita (dollars)	2008	2009	2010
	Algeria	251.7	6,966	2.4	2.4
Angola	109.5	5,749	13.8	2.4	3.4
Benin	13.9	1,446	5.0	2.7	2.6
Botswana	27.8	15,180	3.0	-4.9	7.2
Burkina Faso	20.4	1,391	5.2	3.2	7.9
Burundi	3.4	412	4.5	3.5	3.9
Cameroon	44.5	2,181	2.6	2.0	3.2
Cape Verde	1.9	3,737	6.2	3.7	5.4
Central African Republic	3.5	747	2.0	1.7	3.3
Chad	18.8	1,842	1.7	-1.2	13.0
Comoros	0.8	1,208	1.0	1.8	2.1
Congo (Brazzaville)	17.1	4,426	5.6	7.5	8.8
Congo (Kinshasha)	23.2	329	6.2	2.8	7.2
Côte d'Ivoire	37.1	1,683	2.3	3.8	2.4
Djibouti	2.1	2,537	5.8	5.0	3.5
Egypt	499.3	6,417	7.2	4.7	5.1
Equatorial Guinea	23.9	18,209	10.7	5.7	-0.8
Eritrea	3.6	683	-9.8	3.9	2.2
Ethiopia	86.4	1,019	11.2	10.0	8.0
Gabon	22.6	15,072	2.3	-1.4	5.7
Gambia, The	3.5	2,032	6.3	6.7	6.1
Ghana	64.6	2,725	8.4	4.0	7.7
Guinea	10.8	1,049	4.9	-0.3	1.9
Guinea-Bissau	1.8	1,087	3.2	3.0	3.5
Kenya	66.6	1,676	1.5	2.6	5.6
Lesotho	3.4	1,351	4.3	3.1	3.6
Liberia	1.7	396	7.1	4.6	5.6
Libya	90.8	13,846	2.3	-2.3	4.2
Madagascar	20.0	938	7.1	-3.7	0.6
Malawi	12.9	821	8.3	9.0	6.5
Mali	17.0	1,272	5.0	4.5	5.8
Mauritania	6.7	2,110	3.5	-1.2	5.2
Mauritius	18.2	14,194	5.5	3.0	4.2
Mayotte	NA	NA	NA	NA	NA
Morocco	152.7	4,794	5.6	4.9	3.7
Mozambique	21.8	1,012	6.8	6.3	6.8
Namibia	14.7	6,935	4.3	-0.7	4.8
Niger	11.1	761	9.6	-0.9	8.0
Nigeria	380.2	2,437	6.0	7.0	8.7
Reunion	NA	NA	NA	NA	NA
Rwanda	12.3	1,232	11.2	4.1	7.5
Sao Tome e Principe	0.3	1,886	5.8	4.0	4.5
Senegal	24.0	1,825	3.2	2.2	4.2
Seychelles	2.1	23,308	-1.3	0.7	6.2
Sierra Leone	4.7	810	5.5	3.2	5.0
Somalia	5.9 ³	600 ³	2.6	2.6	2.6
South Africa	525.8	10,518	3.6	-1.7	2.8
Sudan	95.5	2,380	3.7	4.6	6.5
Swaziland	6.1	5,156	3.1	1.2	2.0
Tanzania	58.6	1,417	7.3	6.7	6.4
Togo	6.0	863	2.4	3.2	3.7
Tunisia	99.7	9,454	4.5	3.1	3.1
Uganda	42.3	1,244	8.7	7.2	5.2

See footnotes at end of table.

TABLE 2—Continued
AFRICA: GROSS DOMESTIC PRODUCT^{1,2}

Country	Gross domestic product based on purchasing power parity		Real gross domestic product growth rate (percentage)		
	Gross value	Per capita	2008	2009	2010
	(billion dollars)	(dollars)			
Western Sahara	0.9 ^{3,4}	2,500 ^{3,4}	NA	NA	NA
Zambia	20.1	1,516	5.7	6.4	7.6
Zimbabwe	5.5	436	-17.7	6.0	9.0
Total	3,019.9	215,814	XX	XX	XX
World total	74,385	XX	2.8	-0.7	5.1

NA Not available. XX Not applicable.

¹Source: International Monetary Fund, World Economic Outlook Database, September 2011.

²Gross domestic product listed may differ from that reported in individual country chapters owing to differences in the source or date of reporting.

³Source: U.S. Central Intelligence Agency, The World Factbook 2011.

⁴2007 estimate.

TABLE 3
SELECTED SIGNIFICANT AFRICAN EXPLORATION ACTIVITY IN 2010

Country	Type ¹	Site	Commodity ²	Company	Resource ^{2,3}
Botswana	E	Ghanzi	Cu, Ag	Hana Mining Ltd.	1.8 Mt Cu, 61 Moz Ag (IF)
Burkina Faso	P	Belahouro	Au	Avoceet Mining plc.	1.1 Moz Au (R)
Do.	E	Bombore	Au	Orezone Gold Corp.	1.6 Moz Au (D)
Do.	E	Goulagou	Au	Riverstone Resources Inc.	824,000 oz Au (D)
Do.	E	Kiaka	Au	Volta Resources Inc.	1.4 Moz Au (ID)
Egypt	P	Sukari	Au	Centramin Egypt Ltd.	9.1 Moz Au (R)
Ghana	E	Wa-Lawra	Au	Azumah Resources Ltd.	646,000 oz Au (ID)
Guinea	E	Kalia	Iron ore	Bellzone Mining Ltd.	185 Mt Fe (D)
Liberia	F	New Liberty	Au	African Aura Mining Inc.	1.4 Moz Au (T)
Do.	E	Putu Range	Iron ore	do.	405 Mt Fe (IF)
Mauritania	P	Tasiast	Au	Kinross Gold Corp.	5 Moz Au (R)
Senegal	F	Massawa	Au	Randgold Resources Inc.	1.6 Moz Au (R)
Sierra Leone	F	Marampa	Iron ore	London Mining plc.	36 Mt Fe (ID)
Do. Ditto.					

¹E—Active exploration; F—Feasibility work ongoing/completed; P—Exploration related to existing producing operation.

²Abbreviations used in this table for commodities include the following: Ag—silver; Au—gold; Cu—copper; Fe—iron.

Abbreviations used in this table for units of measure include the following: Moz—million troy ounces; Mt—million metric tons; oz—troy ounces.

³Based on 2010 data reported from various sources; D—measured + indicated; ID—indicated; IF—inferred; R—proven + probable; T—total resource. Resource data not verified by the U.S. Geological Survey.

TABLE 4

AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2010¹

(Thousand metric tons unless otherwise specified)

Country	Metals										
	Aluminum		Chromite, mine output, gross weight	Cobalt, mine output, Co content (metric tons)	Copper, mine output, Cu content	Gold, mine output (kilograms)	Iron and steel		Lead, mine output, Pb content (metric tons)	Manganese ore, mine output, Mn content	
	Bauxite	Metal ²					Iron ore, gross weight	Steel, crude			
Algeria	--	--	--	--	--	723	1,469	688	--	--	
Angola ^e	--	--	--	--	--	--	--	--	--	--	
Benin ^e	--	--	--	--	--	20	--	--	--	--	
Botswana	--	--	--	--	28	1,800 ^e	--	--	--	--	
Burkina Faso ^e	--	--	--	--	--	24,104 ^{3,4}	--	--	--	18	
Burundi	--	--	--	--	--	750 ^e	--	--	--	--	
Cameroon ^e	--	60 ⁴	--	--	--	1,800	--	--	--	--	
Cape Verde ^e	--	--	--	--	--	--	--	--	--	--	
Central African Republic	--	--	--	--	--	60	--	--	--	--	
Chad ^e	--	--	--	--	--	100	--	--	--	--	
Congo (Brazzaville) ^e	--	--	--	--	--	150	--	--	--	--	
Congo (Kinshasa) ^e	--	--	--	61,000	440	3,500	--	120	--	76	
Côte d'Ivoire ^e	--	--	--	--	--	5,310 ⁴	--	--	--	5	
Egypt ^e	--	400	--	--	--	4,607 ⁴	256	6,700	--	--	
Equatorial Guinea ^e	--	--	--	--	--	200	--	--	--	--	
Eritrea ^e	--	--	--	--	--	35	--	--	--	--	
Ethiopia	--	--	--	--	--	5,936	--	110 ^e	--	--	
Gabon ^e	--	--	--	--	--	300	--	--	--	1,500	
Ghana	512	--	--	--	--	76,332	--	--	--	420 ^e	
Guinea	15,100	--	--	--	--	15,217 ⁵	--	--	--	--	
Kenya	--	6 ^e	--	--	--	2,000	(6) ^e	--	--	--	
Lesotho	--	--	--	--	--	--	--	--	--	--	
Liberia ^e	--	--	--	--	--	800	--	--	--	--	
Libya	--	--	--	--	--	--	--	825	--	--	
Madagascar ^e	--	--	90	700	--	70	--	--	--	--	
Malawi	--	--	--	--	--	--	--	--	--	--	
Mali	--	--	--	--	--	36,344	--	--	--	--	
Mauritania	--	--	--	--	37	8,300	11,500	5 ^e	--	--	
Mauritius	--	--	--	--	--	--	--	--	--	--	
Morocco and Western Sahara	--	--	--	3,130	14 ^e	650 ^e	45	455 ^e	32,461	40 ^e	
Mozambique	11 ^e	557	--	--	--	80 ^e	--	--	--	--	
Namibia	--	--	--	--	--	2,683	--	--	10,140	12 ^e	
Niger ^e	--	--	--	--	--	1,900	--	--	--	--	

See footnotes at end of table.

TABLE 4—Continued
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2010¹

(Thousand metric tons unless otherwise specified)

Country	Metals—Continued										
	Aluminum		Chromite, mine output, gross weight	Cobalt,		Copper, mine output, Cu content	Gold, mine output (kilograms)	Iron and steel		Lead, mine output, Pb content (metric tons)	Manganese ore, mine output, Mn content
	Bauxite	Metal ²		mine output, Co content (metric tons)	Iron ore, gross weight			Steel, crude			
Nigeria ^e	--	21	--	--	--	600	410	NA	--	--	
Reunion	--	--	--	--	--	--	--	--	--	--	
Rwanda	--	--	--	--	20 ^e	--	--	--	--	--	
Senegal	--	--	--	--	4,381	--	--	--	--	--	
Sierra Leone	1,090	--	--	--	270	--	--	--	--	--	
South Africa	--	807	10,871	400 ^e	103	188,701	8,480	58,709	50,625	2,900	
Sudan	--	--	57	--	--	26,317	--	--	--	186	
Swaziland	--	--	--	--	--	--	--	--	--	--	
Tanzania	130 ^e	--	--	--	5	39,448	--	--	--	--	
Togo	--	--	--	--	--	13,000	--	--	--	--	
Tunisia	--	--	--	--	--	--	150	194	--	--	
Uganda	--	--	--	--	--	--	4	7 ^e	--	--	
Zambia ^e	--	--	--	5,700	820	3,400	40	--	--	40	
Zimbabwe ^e	--	--	510	60	5	9,100	14	--	--	--	
Total	16,800	1,850	11,500	71,000	1,450	479,000	18,000	72,200	93,200	5,200	
Share of world total	8%	4%	48%	70%	9%	19%	1%	3%	2%	36%	
United States	NA	1,730	--	--	1,110	231,000	80,500	49,900	369,000	--	
Share of world total	NA	3%	--	--	7%	9%	6%	2%	9%	--	
World total	216,000	49,800	24,000	101,000	15,800	2,560,000	1,440,000	2,600,000	4,170,000	14,600	

See footnotes at end of table.

TABLE 4—Continued
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2010¹

(Thousand metric tons unless otherwise specified)

Country	Metals— Continued		Industrial minerals				Mineral fuels	
	Zinc, mine output, Zn content (metric tons)	Cement, hydraulic (metric tons)	Diamond, natural (thousand carats) ⁷	Graphite (metric tons)	Phosphate rock, gross weight	Coal, anthracite and bituminous	Petroleum, crude (thousand 42- gallon barrels)	Uranium, U ₃ O ₈ content (metric tons)
Algeria	--	19,100	--	--	1,525	--	660,000 ^e	--
Angola ^e	--	1,500	13,000 ^{8,9}	--	--	--	676,000 ⁴	--
Benin ^e	--	1,500	--	--	--	--	--	--
Botswana	--	--	21,000 ¹⁰	--	--	780 ^e	--	--
Burkina Faso ^e	--	30	--	--	2	--	--	--
Burundi	--	--	--	--	--	--	--	--
Cameroon ^e	--	1,000	12	--	--	--	30,000	--
Cape Verde ^e	--	160	--	--	--	--	--	--
Central African Republic	--	--	302	--	--	--	--	--
Chad ^e	--	--	--	--	--	--	44,500 ^e	--
Congo (Brazzaville) ^e	--	80	381 ⁴	--	--	--	107,000	--
Congo (Kinshasa) ^e	15,546 ⁴	527 ⁴	16,800 ⁴	--	--	120	8,586 ⁴	--
Côte d'Ivoire ^e	--	283	--	--	--	--	16,400	--
Egypt ^f	--	43,874 ⁴	--	--	4,622 ⁴	300	268,640 ⁴	--
Equatorial Guinea ^e	--	--	--	--	--	--	74,000 ^e	--
Eritrea ^e	--	45	--	--	--	--	--	--
Ethiopia	--	2,900 ^e	--	--	--	--	--	--
Gabon ^e	--	200	1	--	--	--	89,425 ⁴	--
Ghana	--	2,400 ^e	334	--	--	--	--	--
Guinea	--	237	374	--	--	--	--	--
Kenya	--	3,710	--	--	--	--	--	--
Lesotho	--	--	100	--	--	--	--	--
Liberia ^e	--	67	25	--	--	--	--	--
Libya	--	7,000 ^e	--	--	--	--	616,000	--
Madagascar ^e	--	410	--	3,783 ⁴	--	--	--	--
Malawi	--	250 ^e	--	--	--	79 ^e	--	790
Mali	--	--	--	--	--	--	--	--
Mauritania	--	340 ^e	--	--	--	--	3,005	--
Mauritius	--	--	--	--	--	--	--	--
Morocco and Western Sahara	43,680	14,000 ^e	--	--	26,603	--	1,575	--
Mozambique	--	884	--	--	--	50	--	--
Namibia	53,624	--	1,693	--	--	--	--	5,473

See footnotes at end of table.

TABLE 4—Continued
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2010¹

(Thousand metric tons unless otherwise specified)

Country	Metals— Continued		Industrial minerals				Mineral fuels	
	Zinc, mine output, Zn content (metric tons)	Cement, hydraulic	Diamond, natural (thousand carats) ⁷	Graphite (metric tons)	Phosphate rock, gross weight	Coal, anthracite and bituminous	Petroleum, crude (thousand 42- gallon barrels)	Uranium, U ₃ O ₈ content (metric tons)
Niger ^e	--	40	--	--	--	225	--	4,949 ⁴
Nigeria	--	5,400	--	--	--	450	896,043 ⁴	--
Reunion	--	400 ^e	--	--	--	--	--	--
Rwanda	--	95	--	--	--	--	--	--
Senegal	--	4,066	--	--	976	--	398	--
Sierra Leone	--	301	438	--	--	--	--	--
South Africa	36,142	10,870	8,868	--	2,494	254,522	1,358	682
Sudan	--	2,113	--	--	--	--	168,656	--
Swaziland	--	--	--	--	--	146	--	--
Tanzania	--	2,312	80 ¹¹	--	1	--	--	--
Togo	--	NA ^e	(6)	--	720	--	--	--
Tunisia	--	7,530	--	--	7,281	--	30,000	--
Uganda	--	1,347	--	--	--	--	--	--
Zambia ^e	--	1,127 ⁴	--	--	--	200	--	--
Zimbabwe ^e	--	800	8,435 ⁴	5,000	63	2,400	--	--
Total	149,000	137,000	71,800	8,780	44,300	259,000	3,690,000	11,900
Share of world total	1%	4%	57%	1%	24%	4%	13%	19%
United States	748,000	67,200	--	--	25,800	918,000	4,570,000	1,960
Share of world total	6%	2%	--	--	14%	15%	16%	3%
World total	12,100,000	3,360,000	127,000	1,170,000	182,000	6,230,000	28,400,000	62,100

¹Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. ²Preliminary. NA Not available. -- Zero or zero percent.³Totals may not add owing to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of February 3, 2012.⁴Primary and secondary production.⁵Includes artisanal mining, which was estimated to be 1,600 kilograms.⁶Reported figure.⁷Does not include artisanal mining production, which has historically ranged between 1,500 and 5,000 kilograms per year.⁸Less than 1/2 unit.⁹Gemstones and industrial diamond.¹⁰Does not include smuggled production.¹¹Production was approximately 90% gem and 10% industrial grade.¹²Assumed to contain about 70% gem and near gem.¹³Diamond figures are estimated to represent 85% gem-quality or semigem-quality and 15% industrial-quality stones. Does not include smuggled artisanal production.

TABLE 5
AFRICA: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 2000–2017¹

(Thousand metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Ghana	504	727	512	1,500	1,500	1,500
Guinea	15,700	14,600	15,100	15,000	27,000	37,000
Mozambique	8	10	11	11	11	11
Sierra Leone	--	--	1,090	1,100	6,100	11,100
Tanzania	--	2	130	130	130	130
Total	16,200	15,300	16,800	17,700	34,700	49,700

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

TABLE 6
AFRICA: HISTORIC AND PROJECTED ALUMINUM PRODUCTION, 2000–2017¹

(Thousand metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Cameroon	86	87	60	60	60	60
Egypt	189	244	400	400	450	450
Ghana	137	--	--	120	550	700
Kenya ²	2	2	6	6	6	6
Mozambique	54	555	557	560	560	560
Nigeria	--	--	21	50	96	96
South Africa	673	846	807	810	810	810
Total	1,100	1,700	1,900	2,000	2,500	2,700

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

²Kenya produced secondary refined aluminum; primary production in all other African aluminum-producing countries.

TABLE 7
AFRICA: HISTORIC AND PROJECTED COBALT MINE PRODUCTION, 2000–2017¹

(Cobalt content in metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Congo (Kinshasa)	10,000	24,500	61,000	95,700	105,000	116,000
Madagascar	--	--	700	4,900	5,600	5,600
Morocco	1,300	1,600	3,130	3,200	3,200	3,200
South Africa	580	620	400	1,000	1,000	1,000
Zambia	4,600	9,300	5,700	7,000	7,000	7,000
Zimbabwe	79	281	60	200	200	200
Total	16,600	36,300	71,000	112,000	122,000	133,000

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

TABLE 8
AFRICA: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 2000–2017¹

(Metal content in thousand metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Botswana	35	31	28	28	30	30
Congo (Kinshasa)	31	97	440	777	947	991
Eritrea	--	--	--	70	70	17
Mauritania	--	--	37	37	40	40
Morocco	7	4	14	14	14	14
Namibia	6	10	--	7	7	7
South Africa	137	89	103	106	106	106
Tanzania ²	--	4	5	7	7	7
Zambia	249	447	820	900	1,000	1,600
Zimbabwe	2	3	5	6	6	6
Total	470	690	1,500	2,000	2,200	2,800

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

²Copper contained in concentrates and dore.

TABLE 9
AFRICA: HISTORIC AND PROJECTED REFINED COPPER PRODUCTION, 2000–2017¹

(Thousand metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Congo (Kinshasa)	--	--	262	655	855	899
Egypt ²	4	3	3	3	3	3
South Africa	126	99	81	85	85	85
Zambia	227	399	530	600	600	600
Zimbabwe	10	7	5	5	5	5
Total	370	510	880	1,300	1,500	1,600

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

²Egypt produced secondary refined copper; primary production in all other African countries.

TABLE 10
AFRICA: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 2000–2017¹

(Metal content in kilograms)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Algeria	--	637	723	1,100	1,100	1,100
Benin ²	--	20	20	20	20	20
Botswana	4	2,709	1,800	1,800	1,700	1,600
Burkina Faso ³	625	1,397	24,104	36,500	46,900	51,800
Burundi	--	750	750	750	750	750
Cameroon ²	1,000	1,889	1,800	1,800	1,800	1,800
Central African Republic ⁴	15	15	60	4,000	6,400	6,400
Chad	120	150	100	50	50	500
Congo (Brazzaville)	10	120	150	150	150	150
Congo (Kinshasa)	69	7,200	3,500	8,000	23,800	26,100
Cote d'Ivoire ³	3,444	1,335	5,310	15,600	16,000	16,000
Egypt	--	--	4,607	6,200	6,200	6,200
Equatorial Guinea	500	200	200	200	200	200
Eritrea	264	25	35	3,900	8,000	3,900
Ethiopia	3,206	4,376	5,936	14,000	13,400	15,600
Gabon ²	70	300	300	300	300	300
Ghana ³	72,080	66,852	76,332 ³	87,800	103,000	106,000
Guinea ³	15,788	25,097	15,217	15,500	18,000	18,000
Kenya	1,243	616	2,000	2,100	2,100	2,100
Liberia ²	25	27	800	800	800	800
Madagascar	5	10	70	70	70	70
Mali ³	28,717	44,230	36,344	49,500	49,700	45,600
Mauritania	--	--	8,300	10,500	49,000	49,000
Morocco	505	1,786	650	650	650	650
Mozambique	23	63	80	80	80	80
Namibia	2,417	2,703	2,683	2,700	2,700	2,700
Niger	25	4,962	1,900	2,000	2,000	2,000
Nigeria	52	30	600	600	600	600
Rwanda	10	10	20	20	20	20
Senegal	550	600	4,381	11,800	21,600	24,700
Sierra Leone ⁴	--	53	270	300	6,500	6,500
South Africa	430,800	294,671	188,701	221,000	228,000	223,000
Sudan	5,774	3,625	26,317	31,600	32,500	29,700
Tanzania	15,060	47,270	39,448	48,600	51,600	56,300
Togo	--	6,179	13,000	13,000	13,000	13,000
Uganda	56	46	--	--	--	--
Zambia	600	440	3,400	3,500	3,500	4,000
Zimbabwe	22,069	14,024	9,100	10,000	20,000	20,000
Total	605,000	534,000	479,000	607,000	732,000	737,000

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

²From artisanal mining.

³Excludes production from artisanal mining.

⁴From artisanal mining for the years 2000, 2005, and 2010 only.

TABLE 11
AFRICA: HISTORIC AND PROJECTED IRON ORE MINE PRODUCTION, 2000–2017¹

(Fe content in thousand metric tons)

Country	Average grade	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Algeria	50%	820	800	735	1,500	1,500	1,500
Egypt	55%	1,045	880	141	1,000	1,000	1,000
Gabon	64%	--	--	--	640	3,200	12,800
Guinea	58% to 65%	--	--	--	7,100	103,000	119,000
Kenya	54%	--	--	--	--	200	400
Mauritania	59% to 72%	7,500	7,000	7,500	8,500	10,000	10,000
Morocco	54%	4	4	24	25	25	25
Mozambique	68%	--	--	--	--	820	1,700
Nigeria	36%	9	20	18	--	50	50
Senegal	58%	--	--	--	--	--	4,350
Sierra Leone	59% to 65%	--	--	--	9,360	10,100	10,100
South Africa	62% to 65%	21,570	24,900	36,900	46,700	48,900	49,500
Tanzania	52%	--	--	--	--	200	1,100
Tunisia	54%	98	108	81	150	150	150
Uganda	61% to 67%	3	--	2	2	2	2
Zimbabwe ²	51%	225	185	--	--	100	200
Total		31,300	33,900	45,400	75,000	179,000	212,000

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

²Average iron content for Zimbabwe prior to 1996 was 61%. Since 1996, the average grade has been 51%.

TABLE 12
AFRICA: HISTORIC AND PROJECTED STEEL PRODUCTION, 2000–2017¹

(Thousand metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Algeria	842	1,007	688	1,500	1,500	1,500
Congo (Kinshasa)	159	110	120	120	120	120
Egypt	2,838	5,565	6,700	8,000	8,000	8,000
Ethiopia	NA	60	110	110	110	110
Kenya	--	--	--	250	750	1,250
Libya	1,055	1,255	825	1,000	2,000	2,000
Mauritania	5	1	5	5	5	5
Morocco	5	205	455	500	500	500
Nigeria	--	100	410	500	500	1,000
South Africa	8,481	9,494	8,480	8,500	8,500	8,500
Tanzania	--	--	--	--	130	750
Tunisia	237	66	194	240	250	250
Uganda	7	30	7	--	--	--
Zambia	--	--	40	--	--	--
Zimbabwe	258	107	14	20	200	400
Total	13,900	17,600	18,000	20,000	22,600	24,400

^eEstimated. NA Not available. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

TABLE 13
AFRICA: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 2000–2017¹

(Metal content in kilograms)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Ethiopia	--	--	8	--	--	--
South Africa	114,459	163,711	147,790	174,000	188,000	193,000
Zimbabwe	505	4,834	8,800	11,000	12,000	13,000
Total	115,000	169,000	157,000	185,000	200,000	206,000

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

TABLE 14
AFRICA: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 2000–2017¹

(Metal content in kilograms)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
South Africa	55,818	82,961	82,222	97,200	106,000	108,000
Zimbabwe	366	3,879	7,000	9,000	11,000	11,000
Total	56,200	86,800	89,200	106,000	117,000	119,000

^eEstimated.

¹Estimated data and totals are rounded to no more than three significant digits.

TABLE 15
AFRICA: HISTORIC AND PROJECTED TIN MINE PRODUCTION, 2000–2017¹

(Metal content in metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Burundi	6	4	12	12	12	12
Congo (Kinshasa)	50	4,400	6,300	4,000	4,000	4,000
Egypt	--	--	--	1,530	1,530	1,530
Niger	22	14	12	12	12	12
Nigeria	2,760	1,300	180	200	200	200
Rwanda	276	170	1,400	1,500	1,500	1,500
Total	3,100	5,900	7,900	7,300	7,300	7,300

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

TABLE 16
AFRICA: HISTORIC AND PROJECTED TIN METAL PRODUCTION, 2000–2017¹

(Metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Nigeria	25	25	--	--	--	--
Rwanda	--	200	--	--	--	--
Total	30	230	--	--	--	--

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

TABLE 17
AFRICA: HISTORIC AND PROJECTED DIAMOND MINE PRODUCTION, 2000–2017¹

(Thousand carats)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Angola	4,313	7,079	13,000	10,000	10,000	10,000
Botswana	24,635	31,890	21,000	28,000	28,000	28,000
Cameroon	NA	12	12	12	12	12
Central African Republic	464	383	302	400	400	400
Congo (Brazzaville)	50	--	381	400	400	400
Congo (Kinshasa)	16,006	35,207	16,800	19,500	19,500	19,500
Côte d'Ivoire	320	300	--	300	300	300
Gabon	1	(2)	(2)	(2)	(2)	(2)
Ghana	878	1,013	334	300	900	900
Guinea	327	549	374	400	400	400
Lesotho	2	52	100	100	100	100
Liberia	170	NA	25	30	30	30
Namibia	1,552	1,902	1,693	1,800	2,000	2,000
Sierra Leone	77	669	438	500	500	500
South Africa	10,790	15,776	8,868	8,200	8,500	9,100
Tanzania	354	220	80	510	640	640
Togo	NA	41	(2)	(2)	(2)	(2)
Zimbabwe	23	251	8,435	10,000	11,000	10,000
Total	60,000	95,300	71,800	80,500	82,700	82,300

^eEstimated. NA Not available. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

²Less than 1 unit.

TABLE 18
AFRICA: HISTORIC AND PROJECTED LITHIUM PRODUCTION, 2000–2017

(Metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Zimbabwe	1,100	1,100	700	800	800	800

^eEstimated data are rounded to no more than three significant digits.

TABLE 19
AFRICA: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 2000–2017¹

(Thousand metric tons)

Country	2000	2005	2010	2013 ^e	2015 ^e	2017 ^e
Botswana	947	985	780	800	800	800
Congo (Kinshasa)	--	120	120	120	120	120
Egypt	39	300	300	360	360	360
Ethiopia	--	--	20	20	20	20
Malawi	34	52	79	80	80	80
Morocco	31	(2)	--	--	--	--
Mozambique	16	3	50	15,700	31,000	42,000
Niger	158	182	225	230	230	230
Nigeria	12	8	450	500	500	750
South Africa	224,118	244,940	254,522	293,000	330,000	351,000
Swaziland	178	222	146	150	150	150
Tanzania	79	31	--	1,000	3,000	5,500
Zambia	168	240	200	300	300	300
Zimbabwe	3,809	2,891	2,400	4,000	4,000	4,000
Total	230,000	250,000	259,000	316,000	371,000	405,000

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits.

²Less than 1 unit.