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PLATINUM-GROUP METALS

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Platinum-Group Metals

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In 2011, Stillwater Mining Co. (SMC) (Billings, MT), the only domestic mine producer of platinum-group metals (PGMs), recovered PGMs from its Stillwater Mine near Nye, MT, and its East Boulder Mine south of Big Timber, MT.

In 2011, the automobile industry continued to be a major consumer of PGMs. Autocatalysts accounted for approximately 82% of global rhodium consumption, 71% of palladium consumption, and 39% of platinum consumption. Jewelry was the second leading use of platinum in 2011, accounting for 31% of global consumption (Butler, 2012, p. 27–32).

In 2011, world mine production of PGMs totaled 481,000 kilograms (kg), a 3% increase relative to that of 2010.

Legislation and Government Programs

The Defense Logistics Agency, Strategic Materials reported no PGM sales in 2011; 18 kg of iridium and 261 kg of platinum remained in the stockpile. Palladium stocks were exhausted in 2004.

In December 2011, owing to problems in the procurement process, the U.S. Mint canceled a study to explore the feasibility of producing an American Eagle 1-ounce palladium bullion coin. An independent study to determine potential demand for palladium bullion coins prior to their production was mandated under the American Eagle Palladium Bullion Coin Act of 2010, Public Law 111–303. The U.S. Mint planned to reissue a solicitation for the study in 2012. Once begun, the study was expected to take no more than 90 days to complete (Gilkes, 2012).

In 2011, the U.S. Mint did not sell any platinum American Eagle Bullion coins (U.S. Mint, 2012).

Production

Primary.—During 2011, the Stillwater Mine produced 9,250 kg of palladium and 2,790 kg of platinum, increases of 11% and 10%, respectively, compared with production in 2010. The increase in production was a result of improved ore grades. The East Boulder Mine produced 3,160 kg of palladium and 914 kg of platinum, which was a slight decrease for platinum and palladium from that of 2010. Total palladium and platinum production for SMC increased by 7% each, and production of 156 kg of rhodium was 150% greater than that of 2010. SMC milled 1.18 million metric tons (Mt) of ore from the mines, slightly less than that of 2010. In 2011, the Stillwater and East Boulder Mines processed 2,020 and 1,140 metric tons per day of ore, respectively, about the same rates as in 2010. Mill recovery of PGMs was about 92% at the Stillwater Mine and about 89% at the East Boulder Mine, unchanged from the recovery rates in 2010. SMC planned to produce 15,600 kg of PGMs in 2012 (Stillwater Mining Co., 2012, p. 8, 53, 54).

SMC continued to develop the Blitz and Graham Creek projects, both of which were extensions of the existing mines. The Graham Creek project, located west of the East Boulder Mine, consisted of a 2,500-meter (m) extension of East Boulder's main travel way. The extension could be completed in the first half of 2013, followed by a multiyear drilling program to delineate the extent of the deposit. The Blitz project, located east of the Stillwater Mine, consisted of tunneling about 7,000 m east of the Stillwater Mine shaft and was expected to take several years to complete.

At yearend 2011, SMC reported proven and probable reserves in its Montana operations of 42.5 Mt of ore with an average grade of 15 grams per metric ton (g/t) and containing about 621,000 kg of palladium and platinum, with an in-situ palladium-to-platinum ratio of about 3.57 to 1. Average PGM mill head grades were 16 g/t at the Stillwater Mine and 11 g/t at the East Boulder Mine. SMC's proven and probable reserves of PGMs in its Montana operations are contained in the J-M Reef, an ore body within the layered mafic and ultramafic igneous rocks of the Stillwater Complex (Stillwater Mining Co., 2012, p. 8).

SMC had a 3-year agreement, effective in January 2011, to supply General Motors Corp. (Detroit, MI) monthly deliveries of fixed quantities of palladium. SMC also had a 1-year agreement with Tiffany & Co. (New York, NY) to supply platinum, and at yearend had pending 1-year platinum and palladium supply agreements with Johnson Matthey plc (London, United Kingdom) and Ford Motor Co. (Detroit, MI) (Stillwater Mining Co., 2012, p. 28).

In 2011, PGM exploration continued at several locations in the United States. The most advanced projects were in the Duluth Complex of Minnesota. Duluth Metals Ltd. (Toronto, Ontario, Canada) completed its acquisition of all the remaining shares of Franconia Minerals Corp. (Spokane Valley, WA) and then rolled Franconia into Twin Metals Minnesota LLC (St. Paul, MN), which was a Duluth (60%) and Antofagasta plc (Santiago, Chile) (40%) joint venture. The transaction consolidated the land holdings of Twin Metals in the Duluth Complex, which included the Birch Lake, Maturi, Nokomis, and Spruce Road copper-nickel-PGM deposits (Duluth Metals Ltd., 2011).

PolyMet Mining Corp. (Hoyt Lakes, MN) continued the environmental review and permitting process for the NorthMet Mine in the Duluth Complex. The supplemental draft environmental impact statement was expected to be completed and submitted for public review and comment in the fall of 2012. No production expectation was given (PolyMet Mining Corp., 2012).

Secondary.—In 2011, PGMs were recycled from three main sources—autocatalysts, electronics, and jewelry. The global

recovery of platinum from recycling autocatalysts increased by 13% in 2011 compared with that of 2010, reaching 38,100 kg. In North America, an estimated 20,000 kg of platinum was recovered from catalytic converters, which was a 10% increase from that in 2010, and represented roughly 52% of global autocatalyst recycled material. Platinum recovered from catalytic converters increased by 19% in Europe, was unchanged in China, and decreased by 8% in Japan compared with 2010 quantities. In the rest of the world, recycling of autocatalysts produced about 27% more platinum in 2011 compared with that of 2010. Globally, increased PGM prices encouraged recycling. About 311 kg of platinum was recovered from electronics recycling in 2011, which was the same amount recovered in 2010. About 25,200 kg of platinum was recovered from the jewelry industry globally, an increase of 10% compared with that of 2010 (Butler, 2012, p. 22–23).

Globally, about 51,500 kg of palladium was recovered from autocatalysts in 2011, an increase of 26% compared with that of 2010. Roughly 63% of recycled palladium came from North America. Palladium recovery from autocatalysts in North America increased by 33% to 32,700 kg, and that in Europe increased by 15% to 12,000 kg. Palladium recovery from autocatalysts in China increased by 17% and that in Japan decreased by 13%. Recovery of palladium from electronics totaled 15,000 kg in 2011, an increase of 9% compared with that of 2010. Recovery of palladium from the jewelry industry in 2011 increased 110% to about 6,500 kg. In 2011, recovery of rhodium from autocatalysts increased by 16% to 8,700 kg (Butler, 2012, p. 44).

SMC's recycling program recovered 15,100 kg of PGMs in 2011, an increase of 22% compared with that of 2010. Recycled material sales were $376.8 million in 2011, which was more than double the 2010 sales value. SMC reconstructed its original smelting furnace during 2011 and planned to use the furnace to improve metal recoveries and for additional capacity for recycling (Stillwater Mining Co., 2012, p. 10, 52).

Consumption

Palladium.—Global palladium sales were 263,000 kg in 2011, about 13% less than those in 2010. About 71% of palladium was used by the autocatalyst industry, about 16% by the electronics industry, and about 7% by the dental industry. The remainder was used in industries such as chemical, jewelry, and others, and as investment. Global palladium use in autocatalysts reached an alltime high in 2011 owing to higher global vehicle production and greater use of palladium in light-duty vehicles (Butler, 2012, p. 36–43).

Palladium use in autocatalysts worldwide increased by 8% to 188,000 kg in 2011 compared with 2010 consumption. Demand in Europe increased by 8% to 44,800 kg. The increase was owing to increased production levels and increased exports of vehicles to China and the United States.

Consumption in the North American autocatalyst sector increased to 45,900 kg, a 9% increase relative to that of 2010 owing to increased auto production. Palladium consumption in the Japanese autocatalyst industry was 20,600 kg, a 19% decrease compared with that of 2010. Palladium consumption for autocatalysts in China increased to 34,700 kg, an 11% increase relative to that of 2010. Palladium consumption for autocatalysts in the rest of the world increased by 25% to 41,500 kg (Butler, 2012, p. 36–39).

On a global basis, palladium consumption by the jewelry industry was 15,700 kg, a 15% decrease compared with that of 2010. The decreased demand was a result of higher prices early in 2011. China remained the leading user of palladium for jewelry, with 60% of world consumption in that sector. Palladium use in jewelry in 2011 decreased in the much smaller markets in Europe and North America. Consumption in Europe was 1,870 kg of palladium, an 8% decrease relative to that of 2010, and consumption in North America decreased by 31% to 1,400 kg. Consumption in Japan decreased by 7% to 2,180 kg of palladium (Butler, 2012, p. 39–41).

World palladium consumption in dental alloys was 17,100 kg in 2011, which was about 8% less than consumption in 2010. Japan and North America accounted for about 42% and 40%, respectively, of the global consumption in this sector. The chemical industry consumed 13,800 kg of palladium in 2011, a 20% increase from that in 2010, owing to increased consumer demand for end products that use these various chemicals that required palladium in their manufacturing. In the chemical industry, palladium was used as a catalyst in manufacturing bulk chemicals, including purified hydrogen peroxide, nitric acid, purified terephthalic acid, and vinyl acetate monomer, which in turn were used in the production of many resins and plastics as well as polyester and polyethylene terephthalate for use in textiles and packaging. Consumption of palladium by the electronics industry was 42,900 kg in 2011, which was a slight decrease compared with that of 2010, owing partly to increased substitution by other metals in some applications. The majority of demand for palladium in the electronics sector was for multilayer ceramic capacitors (MLCCs), which have widespread use in electronic circuitry. Use of palladium in other applications, mainly stationary-source emissions control, increased by 17% in 2011 compared with that of 2010.

Major selloffs in the palladium investment sector accompanied price decreases in the second half of 2011. Holdings in exchange-traded funds (ETFs) were 54,400 kg at yearend 2011, a decrease of 20% compared with holdings at yearend 2010 (Butler, 2012, p. 43).

Apparent domestic palladium consumption was estimated to be about 79,300 kg, a 79% increase from 44,300 kg in 2010.

Platinum.—In 2011, global platinum sales totaled 252,000 kg, a slight increase compared with sales in 2010. About 39% of the total was used by the autocatalyst industry, about 31% by the jewelry industry, and about 7% by the glass industry. The remainder was purchased for investment or used in other industries including chemical, electrical, and medical and biomedical. Platinum use in the autocatalyst sector increased slightly as a result of an increase in heavy-duty vehicle production. Light-duty vehicle production increased in the United States and in Europe, but decreased in Japan owing to the earthquake and tsunami that took place in March 2011. Growth of light-duty vehicle sales in China decreased owing to Government measures aimed at slowing growth rates (Butler, 2012, p. 4–5).

Worldwide use of platinum in the autocatalyst sector increased slightly to 96,600 kg in 2011 compared with that in 2010. While platinum demand in the heavy-duty diesel sector increased, demand in light-duty vehicles declined owing to increased substitution by palladium and by decreased production after the Japanese earthquake. Consumption in Europe was about 45,600 kg of platinum in 2011, which was slightly less than that of 2010, and accounted for about 47% of the global total. The market share of light-duty diesel vehicles in Europe increased to about 52% in 2011 from 48% in 2010. Consumption in the autocatalyst sector of North America was 11,800 kg, a decrease of 6% in 2011 relative to that of 2010 owing to supply chain disruption that lowered production by Japanese manufacturers in North America after the Japanese earthquake in March. In Japan, platinum consumption in the autocatalyst sector was 15,600 kg, about 9% less than that of 2010. In China, consumption of platinum in the autocatalyst sector increased by 10% to 3,420 kg. Consumption of platinum for autocatalysts increased by 24% in other areas of the world in 2011 relative to that of 2010 (Butler, 2012, p. 27–30).

In 2011, global consumption of platinum in the jewelry industry was 77,100 kg, a slight increase relative to that of 2010. Consumption in North America increased by 6% relative to that of 2010, partly in response to gold's price premium to platinum in the fourth quarter of 2011. Consumption in China increased slightly, and China remained the leading consumer, accounting for 68% of global consumption of platinum for jewelry. Consumption in Europe was the same as that in 2010, consumption in Japan was 3% less, and consumption in the rest of the world increased by 32% to 3,890 kg (Butler, 2012, p. 30–32).

Global use of platinum in the chemical sector was 14,600 kg in 2011, which was an increase of 7% compared with that of 2010, largely owing to increased use of platinum in the production of silicones. Platinum use in the petroleum refining industry increased by 24% to 6,530 kg in 2011 as a result of increased refining capacity in emerging economies. Worldwide consumption of platinum in electrical applications was about 7,150 kg in 2011, the same as that of 2010 (Butler, 2012, p. 33–34).

Platinum equipment was used in the glassmaking industry because of its high melting point and resistance to corrosion. Platinum consumed in the glass industry increased by 44% to 17,300 kg in 2011, owing to increased manufacturing capacity in Asia for liquid crystal displays. Consumption in the medical and biomedical sector was 7,150 kg, which was the same as that in 2010. Consumption in other end uses increased by 18% to 11,000 kg relative to that of 2010, including automotive sensors, coating of aircraft turbine blades, and spark plugs.

Global investment demand for platinum decreased by 30% to 14,300 kg relative to that in 2010 (Butler, 2012, p. 34–35).

In 2011, U.S. apparent consumption of refined platinum was estimated to be about 121,000 kg, a 12% decrease from the apparent consumption of 139,000 kg in 2010.

Other PGMs.—Global rhodium consumption in 2011 was 28,200 kg, a slight increase compared with that of 2010. A majority of rhodium use, 69% in 2011, was in the production of autocatalysts. In 2011, rhodium use in autocatalysts was 22,100 kg, slightly less than that of 2010, as a result of lower light-duty automobile production following the Japanese earthquake. In addition, rhodium demand decreased because of continued thrifting by autocatalyst manufacturers owing to previous high prices. Use of rhodium in the glass manufacturing sector increased by 15% to 2,430 kg compared with that in 2010, owing to increased demand for flat-panel glass, and, owing to lower prices, increased rhodium content of alloys used for fiberglass bushings. Consumption of rhodium in the chemical sector increased by 7% to 2,240 kg in 2011 owing to increased capacity utilization rates in oxoalcohol manufacturing plants in Asia. Demand from the electrical sector increased by 25% in 2011, to 156 kg, and demand in other applications increased by 86% from that of 2010, to 1,210 kg (Butler, 2012, p. 44).

Global consumption of ruthenium decreased by 14% to 25,100 kg in 2011 relative to that in 2010. The consumption of ruthenium in electrical applications decreased by 26% to 15,600 kg, mainly as a result of decreased consumption in the hard disk industry in the second half of the year. Electrochemical demand was 4,040 kg, a 5% decrease; use in the chemical sector was 3,390 kg, a 9% increase; and consumption in other applications increased by 62% to 2,110 kg (Butler, 2011, p. 45).

Global consumption of iridium decreased by 11% to 9,360 kg in 2011 compared with that of 2010. The electrical sector accounted for 55%, 5,130 kg, of total global ruthenium use. Iridium crucibles were used in the electronics industry to grow high-purity single crystals for use in various applications, including single crystal sapphire, which was used in the production of back-lit light-emitting diode displays in televisions and other electronic devices (Butler, 2011, p. 45).

Prices

In 2011, the Engelhard annual average prices of iridium, palladium, and platinum increased by 61%, 39%, and 7%, respectively, compared with the 2010 annual average prices, and decreased for rhodium and ruthenium by 18% and 16%, respectively (table 1).

Iridium.—In the beginning of January, the price of iridium was $780 per troy ounce. The price increased dramatically through late February, when it reached $1,075 per troy ounce. The price decreased slightly in late March, to $1,050 per troy ounce, and then held steady until early September, when it increased steadily, reaching an alltime high of $1,085 per troy ounce in late September, where it remained for the rest of the year. The large price increase was the result of strong industrial purchasing of iridium by the electrochemical and electronics sectors.

Palladium.—Palladium prices began 2011 at $808 per troy ounce, increased to $851 per troy ounce in mid-February, and then decreased to $706 per troy ounce in mid-March. Prices fluctuated between about $710 per troy ounce and $848 per troy ounce until early September, and then plunged throughout September to the year's low of $553 per troy ounce in early October. For the remainder of 2011, the price fluctuated but remained below $690 per troy ounce. The large decrease in

September correlated with concerns about the global economy, which led to a selloff of investments.

Platinum.—In 2011, the annual average platinum price reached an alltime high of $1,724.51 per troy ounce. Throughout the year, daily platinum prices followed a trend similar to those of palladium. Platinum began the year at $1,790 per troy ounce, and fluctuated between $1,677 and $1,892 per troy ounce through mid-September. The price decreased precipitously throughout September, reaching $1,455 per troy ounce in early October. The price increased to $1,665 per troy ounce in early November, and then decreased steadily, finishing the year at $1,395 per troy ounce. The decrease in the latter part of the year corresponded with global uncertainties regarding European sovereign debt problems.

Rhodium.—The rhodium price began the year at $2,425 per troy ounce, increased to $2,500 per troy ounce in late January, where it remained until mid-February, and then decreased steadily to $1,950 per troy ounce at the end of May. The price increased to $2,350 per troy ounce in early June, then decreased steadily to $1,400 per troy ounce at yearend. The decreased price was the result of a lack of buying interest owing to continued concern about the euro area debt crisis.

Ruthenium.—The ruthenium price began the year at $180 per troy ounce, where it remained until early August. The price then decreased continuously to $110 per troy ounce at yearend. The ruthenium price decreased owing to decreased industrial demand.

Foreign Trade

In 2011, the U.S. net import reliance as a percentage of apparent consumption was estimated to be 84% for refined palladium and 97% for refined platinum. Imports of refined palladium in 2011 totaled 98,900 kg, an increase of 40% relative to those of 2010, with three countries accounting for about 90% of refined palladium imports in 2011—Russia (52%), South Africa (29%), and the United Kingdom (9%). Imports of platinum, including waste, scrap, and coins, decreased by 15% in 2011 to 129,000 kg, from 152,000 kg in 2010. Excluding waste and scrap, three countries accounted for 72% of imports of platinum in 2010—South Africa (41%), Germany (19%), and the United Kingdom (12%). Refined imports of other PGM decreased by 4% in 2011 compared with those of 2010. Imports of rhodium increased slightly, and those of iridium, osmium, and ruthenium decreased by 18%, 37%, and 6%, respectively. Three countries accounted for 89% of the imports of other PGM in 2011—South Africa (64%), Germany (13%), and the United Kingdom (12%) (tables 2, 3).

About 32,000 kg of palladium was exported in 2011, a decrease of 16% relative to palladium exports in 2010. Exports of platinum, including waste and scrap, increased by 135% to 130,000 kg, and exports of rhodium decreased by 41% compared with exports in 2010. Exports of iridium, osmium, and ruthenium decreased by 69% during the same time period (table 4).

World Review

In 2011, world mine production of PGMs increased by 4% to 484,000 kg from 466,000 kg in 2010 (table 5). South Africa accounted for 59% of total mine production in 2011; Russia accounted for 26%, Canada and Zimbabwe each accounted for 4%, and the United States accounted for 3%. In 2011, South Africa produced 145,000 kg of platinum, a slight decrease from that in 2010, and accounted for 75% of world production. Global mine production of palladium increased by 5% to 214,000 kg, with Russia and South Africa accounting for 40% and 38%, respectively, and the United States accounting for 6%. World mine production of other PGMs (iridium, osmium, ruthenium, and rhodium) increased by 4% in 2011 compared with that of 2010. South Africa was the dominant producer, accounting for 80% of global production of other PGMs.

Botswana.—In 2011, OJSC MMC Norilsk Nickel (Moscow, Russia) produced 2,100 kg of palladium and 373 kg of platinum as byproducts from its nickel operations at the Tati Mine. These quantities were about 25% less than production in 2010 owing to lower PGM ore grades (OJSC MMC Norilsk Nickel, 2012).

Canada.—SMC continued to make progress on its Marathon PGM-copper project in Ontario, Canada. An environmental assessment was underway as well as detailed engineering plans for the development of an open pit and processing plant. Mine construction was planned to begin in 2013, and the project was expected to have an annual production of about 6,220 kg of platinum and palladium during a mine life of 12 years. SMC planned to crush, grind, and concentrate the ore onsite and to ship the concentrate offsite for smelting and refining. SMC reported proven and probable ore reserves at its Marathon project of 91.4 Mt with an average grade of 0.83 g/t palladium and 0.23 g/t platinum and containing about 74,600 kg of palladium and 21,800 kg of platinum (Stillwater Mining Co., 2012, p. 8). SMC also planned to conduct exploration at its PGM properties at Geordie Lake, Ontario, and Bird River in Manitoba, both of which were acquired along with the Marathon project in November 2010 (Stillwater Mining Co., 2012, p. 22–30).

North American Palladium Ltd. (Toronto) produced 4,560 kg of palladium and 284 kg of platinum from its Lac des Isles Mine in Ontario, increases of 87% and 54%, respectively, compared with production in 2010. The mine reopened in April 2010 after having been placed on care-and-maintenance status in October 2008 in response to low metal prices. Mine expansion was proceeding, and a new mine shaft was expected to be commissioned at the end of 2012. North American Palladium expected to increase production to about 7,800 kilograms per year (kg/yr) of palladium by 2015 (North American Palladium Ltd., 2012, p. 17–18).

Xstrata plc (Zug, Switzerland) produced PGMs as byproducts from nickel mining operations at Sudbury, Ontario, although production figures were not released. Vale Inco Ltd. (Toronto) produced 7,710 kg of palladium and 5,410 kg of platinum as byproducts of its nickel operations at Sudbury, a three-to-four fold increases from production in 2010, following the end of a year-long strike in July 2010 (Butler, 2012, p. 21).

Russia.—In 2011, Russia accounted for 40% of global mine production of palladium, 13% of platinum production, and

17% of other PGMs. Norilsk Nickel produced 84,100 kg of palladium and 20,900 kg of platinum in 2010, a slight increase for platinum and a slight decrease for palladium compared with 2010 production (OJSC MMC Norilsk Nickel, 2012). Russia's alluvial production was estimated to be about 4,100 kg of platinum, which was a 9% decrease compared with 2010 production.

South Africa.—In 2011, South African production of palladium and platinum decreased slightly compared with that in 2010. The world's leading PGM producer, Anglo American Platinum Ltd. (Johannesburg) (Amplats), reported primary refined production of 42,400 kg of palladium and 78,700 kg of platinum in 2011, an increase of 6% for palladium and a slight decrease in platinum production compared with that in 2010. Rhodium production was 10,800 kg in 2011, an increase of 18% from that of 2010. Production of platinum at the Mogalakwena open pit mine increased by 15% to 8,470 kg. Output from the Khuseleka Mine was 4,140 kg of platinum and 2,040 kg of palladium, slight decreases from 2010 production. The Siphumelele Mine produced 3,140 kg and 1,440 kg of platinum and palladium, respectively, which were decreases of 5% and 10%, respectively, relative to that of 2010. Platinum production of 3,580 kg from the Mototolo Mine, a joint venture with Xstrata, was about 4% less than 2010 production. The Kroondal and Marikana Mines, operated as pool-and-share agreements with Aquarius Platinum Ltd. (Perth, Australia), produced 6,770 kg and 1,515 kg of platinum, respectively, which were decreases of 18% and 9% respectively, relative to that of 2010. At Modikwa, a joint venture with African Rainbow Minerals Ltd. (ARM) (Sandton), platinum production decreased by 4% to 4,040 kg. At the Bafokeng-Rasimone Platinum Mine (BRPM) joint venture with Royal Bafokeng Platinum Ltd. (Johannesburg), refined platinum production declined slightly to 5,600 kg. The greatest losses in production took place at the Bathopele, Tumela, and Union Mines, primarily as a result of safety stoppages. Amplats expected to produce 77,800 to 80,900 kg of platinum in 2012 (Anglo American Platinum Ltd., 2012, p. 123–145).

Impala Platinum Holdings Ltd.(Johannesburg) produced 36,000 kg of refined platinum in 2011, a 7% increase compared with that of 2010. Output at the Impala Mine increased by 8% to 29,300 kg of platinum. Production at the Marula Mine decreased by 11% to 2,000 kg of platinum. An expected ramp up in production at Marula was hindered by incomplete infrastructure development. Production of platinum in concentrate at the Two Rivers Mine increased by 5% to 4,630 kg, as a result of continued progress toward ramp up to full capacity (Impala Platinum Holdings Ltd., 2012, p. 60–75).

In 2011, Northam Platinum Ltd. (Johannesburg) reported production from its Zondereinde Mine of nearly 10,000 kg of PGMs in concentrate, about the same as production in 2010 (Northam Platinum Ltd., 2012, p. 2).

Lonmin plc (London) reported production of 42,000 kg of platinum, 11,100 kg of palladium, and 3,080 kg of rhodium, increases of 13%, 16%, and 5%, respectively compared with those in 2010. Production increased despite disruption to operations caused by a workers' strike (Butler, 2012, p.16).

Aquarius Platinum Ltd. (Bedford) resumed production at the Everest Mine in 2010 after completing repairs following subsidence of the mined-out portion of the mine in 2009. Production from Everest increased by 77% to 1,740 kg of platinum in concentrate. Everest Mine faced geologic challenges related to an extensive oxidized area, and Aquarius was performing a strategic review of the mine. Aquarius closed the Blue Ridge Mine in September 2010 for redevelopment and had expected to reopen it in July 2011. However, low metal prices led to an extension of the mine's closure beyond yearend. Production from the Chromite Tailings Retreatment Plant, a joint venture between Aquarius (50%), GB Mining and Exploration Ltd. (Johannesburg) (25%), and Sylvania South Africa Ltd. (West Perth, Australia) (25%), was 100 kg of PGM in 2011 an increase of 18% compared with that of 2010 (Aquarius Platinum Ltd., 2012, p. 9).

The Nkomati Nickel Mine, a 50-50 joint venture between ARM and Norilsk Nickel, produced 2,050 kg of PGMs, 27% less than that of 2010, owing to low PGM grades and recoveries (African Rainbow Minerals Ltd., 2012, p. 55).

Eastern Platinum Ltd.'s (Vancouver, British Columbia, Canada) Crocodile River Mine produced 1,460 kg of platinum in concentrate, 30% less than that in 2010, owing to disruption of operations by strikes (Eastern Platinum Ltd., 2012, p. 3).

Platmin Ltd.'s (Centurion) Pilanesburg Mine was behind schedule in the build-up to full production, owing partly to illegal strike action by workers. Sales of PGM in concentrate totaled 2,210 kg, an increase of 18% compared with that of 2010 (Butler, 2012, p. 16).

Platinum Australia Ltd.'s (West Perth) Smokey Hills Mine produced about 995 kg of PGM in concentrate, slightly more than that of 2010 but, owing to safety stoppages and strike action, far less than had been anticipated. Platinum Australia continued with a feasibility study of the Kalahari Platinum project and planned to extract a bulk sample for pilot-plant treatment during 2012 (Platinum Australia Ltd., 2012, p. 11).

Zimbabwe.—In 2011, palladium and platinum production increased by 17% and 21%, respectively, compared with that of 2010. The large increases were the result of the first full year of production from Amplats' Unki Mine, which was commissioned in January 2011 and produced 1,070 kg of platinum in concentrate. The Mimosa Mine, a joint venture between Aquarius and Impala, was operating at full capacity, and produced 2,500 kg of palladium and 3,290 kg of platinum, which were increases of 7% and 5%, respectively, compared with production in 2010. Impala's Zimplats Mine produced 4,600 kg of palladium and 5,700 kg of platinum, slight increases compared with that in 2010. The phase I Zimplats expansion project was completed and work on the phase 2 expansion of the Ngezi Mine, including a third underground mine and a second concentrator, was underway. The phase 2 expansion was expected to be completed in 2014 and to achieve full production of 8,400 kg/yr of platinum (Butler, 2011, p. 20).

Outlook

The progress of the global economic recovery is expected to be the main driver of demand for PGMs owing to their use as industrial metals. Because the primary end use for

palladium, platinum, and rhodium is for catalytic converters in automobiles, the outlook for that industry will have the greatest impact on the consumption and prices of these PGMs. Global automobile production is likely to increase, particularly in emerging markets such as China and India; therefore, an overall increase in demand for PGMs in that sector was expected. Tighter emission standards in China were also expected to cause increased palladium demand. Manufacturers continued to switch to palladium-based catalytic converters and to increase palladium loadings on diesel light-duty vehicles because of the price difference between platinum and palladium. Thus, the increase in automobile demand will likely affect palladium demand in particular. In the electronics sector, palladium demand is likely to remain strong as the global economy recovers because of increasing demand for consumer electronics in which palladium is used in MLCCs. In the glass sector, demand for platinum could decrease owing to an expected near-term slowdown in purchasing by the fiberglass and LCD industries. In the petrochemical sector, near-term demand for platinum and palladium is expected to decrease because of high petrochemical inventories and limited new capacity installation. The demand for platinum in the jewelry sector was expected to be higher than that of 2011, assuming the price premium of gold continues, whereas palladium jewelry demand is likely to be lower. The consumption of rhodium is expected to increase as a result of higher vehicle production in many areas of the world. Ruthenium demand is expected to increase as a result of increased demand from the electrical and electrochemical sectors. Iridium demand is likely to decrease as a result of a stock buildup of crucibles used for the growth of metal oxide single crystals.

Platinum production from South Africa was expected to decrease owing to work stoppages and to the increasing costs associated with mining, such as electricity and wages. Supply from Zimbabwe was expected to increase because of new mining projects, but this may be dependent on the political situation. Palladium supply was expected to decrease in Russia owing to changes in the ore mix and a decline in average palladium ore grade. Recycling of platinum and palladium is expected to increase, particularly in the automotive catalyst recycling sector.

References Cited

African Rainbow Minerals Ltd., 2012, Integrated annual report 2011: Sandton, South Africa, African Rainbow Minerals Ltd., 252 p. (Accessed May 10, 2012, via http://www.arm.co.za/im/r_annual.php.)

Anglo American Platinum Ltd., 2012, Integrated annual report 2011: Johannesburg, South Africa, Anglo American Platinum Ltd., 324 p. (Accessed May 11, 2012, via http://www.angloplatinum.com/investors/reports/2011.asp.)

Aquarius Platinum Ltd., 2012, Annual report 2011: Perth, Australia, Aquarius Platinum Ltd., 127 p. (Accessed May 4, 2012, at http://aquariusplatinum.com/sites/aquariusplatinum.com/files/ckfinder/files/2011_AQP_Annual_Report_v2.pdf.)

Butler, Jonathan, 2012, Platinum 2012: London, United Kingdom, Johnson Matthey plc, 60 p.

Duluth Metals Ltd., 2011, Duluth Metals and Franconia Minerals complete plan of arrangement: Toronto, Ontario, Canada, Duluth Metals Ltd. news release, March 7, 3 p. (Accessed March 12, 2012, at http://www.duluthmetals.com/s/NewsReleases.asp?ReportID=446207&_Type=News-Releases&_Title=Duluth-Metals-and-Franconia-Minerals-Complete-Plan-of-Arrangement.)

Eastern Platinum Ltd., 2012, Consolidated financial statements of Eastern Platinum Limited December 31, 2011 and 2010: Vancouver, British Columbia, Canada, Eastern Platinum Ltd., 78 p. (Accessed May 8, 2012, at http://eastplats.com/_resources/financials/Consolidated_Financial_Statements-December_31_2011.pdf.)

Gilkes, Paul, 2012, Mint to seek new contract on palladium coin study: CoinWorld news release, January 28, 1 p. (Accessed January 30, 2012, at http://www.coinworld.com/articles/mint-to-seek-new-contract-on-palladium-coin-s/.)

Impala Platinum Holdings Ltd., 2012, Integrated annual report 2011: Johannesburg, South Africa, Impala Platinum Holdings Ltd., 220 p. (Accessed May 9, 2012, at http://www.implats.co.za/implats/downloads/2011/annualreports/ImplatsAR_Combined_LoRes.pdf.)

North American Palladium Ltd., 2012, 2011 annual report: Toronto, Ontario, Canada, North American Palladium Ltd., 76 p. (Accessed May 23, 2012, at http://www.napalladium.com/Theme/NAP/files/NAP Annual Report 2011.pdf.)

Northam Platinum Ltd., 2012, Annual integrated report 2011: Johannesburg, South Africa, Northam Platinum Ltd., 138 p. (Accessed May 15, 2012, at http://www.northam.co.za/im/publications/ar/ar_2011/downloads/NORTHAM-AR2011.pdf.)

OJSC MMC Norilsk Nickel, 2012, MMC Norilsk Nickel announces preliminary consolidated production results for 4th quarter 2010 & 12 months 2011, and production outlook for 2012: Moscow, Russia, OJSC MMC Norilsk Nickel news release, January 30, 4 p. (Accessed February13, 2012, at http://www.nornik.ru/_upload/editor_files/file1761.pdf.)

Platinum Australia Ltd., 2012, Annual report 2011: West Perth, Australia, Platinum Australia Ltd., 100 p. (Accessed May 21, 2012, at http://www.gtp.com.au/platinumaus/inewsfiles/PLATINUM_AR2011_WEB.pdf.)

PolyMet Mining Corp., 2012, PolyMet updates status of environmental review: Hoyt Lakes, MN, PolyMet Mining Corp. news release, February 1, 3 p. (Accessed February 22, 2012, at http://www.polymetmining.com/media-news.php.)

Stillwater Mining Co., 2012, 2011 annual report: Billings, MT, Stillwater Mining Co., 113 p. (Accessed April 19, 2012, at http://investorrelations.stillwatermining.com/phoenix.zhtml?c=99837&p=irol-reportsannual.)

U.S. Mint, 2012, 2011 American Eagle bullion sales totals: Washington, DC, U.S. Mint. (Accessed June 4, 2012, at http://www.usmint.gov/mint_programs/american_eagles/?action=sales&year=2011.)

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Historical Statistics for Mineral and Material Commodities in the United States, Data Series 140.

Platinum-Group Metals. Ch. in Metal Prices in the United States Through 1998, 1999.

Platinum-Group Metals. Ch. in Mineral Commodity Summaries, annual.

Platinum-Group Metals. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

Platinum-Group Metals. International Strategic Minerals Inventory Summary Report, Circular 930–E, 1986.

Platinum-Group Metals. Mineral Industry Surveys, monthly, since January 2004.

Precious Metals. Mineral Industry Surveys, monthly, through December 2003.

Other

CPM Group.

Defense Logistics Agency Strategic Materials.

International Platinum Association.

Platinum-Group Metals. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

Platinum Guild International.

Roskill Information Services Ltd.

TABLE 1
SALIENT PLATINUM-GROUP METALS STATISTICS[1]

		2007	2008	2009	2010	2011
United States:						
Mine production:						
Palladium, Pd content:[2]						
Quantity	kilograms	12,800	11,900	12,700	11,600	12,400
Value	thousands	$148,000	$136,000	$108,000	$199,000	$295,000
Platinum, Pt content:[2]						
Quantity	kilograms	3,860	3,580	3,830	3,450	3,700
Value	thousands	$162,000	$182,000	$149,000	$179,000	$205,000
Refinery production:						
Palladium, Pd content:						
Quantity	kilograms	7,410	7,650	7,820	6,820 r	17,500
Value	thousands	$85,100	$87,300	$66,800	$116,000 r	$298,000
Platinum, Pt content:						
Quantity	kilograms	8,930	7,400	7,210	5,410 r	15,500
Value	thousands	$375,000	$376,000	$280,000	$281,000 r	$805,000
Imports for consumption, refined:						
Iridium, Ir content	kilograms	3,410	2,550	1,520	3,530	2,880
Osmium, Os content	do.	23	11	68	76	48
Palladium, Pd content	do.	113,000	120,000	69,700	70,700	98,900
Platinum, includes waste, scrap, and coins, Pt content	do.	181,000	150,000	183,000	152,000	129,000
Rhodium, Rh content	do.	16,600	12,600	11,200	12,800	13,100
Ruthenium, Ru content	do.	48,700	49,800	21,200	14,100	13,200
Exports, refined:						
Iridium, osmium, and ruthenium, gross weight	do.	8,190	6,450	4,020	3,720	1,150
Palladium, Pd content	do.	41,800	26,400	30,300	38,100	32,000
Platinum, Pt content	do.	28,900	15,600	15,600	16,900	11,300
Rhodium, Rh content	do.	2,210	1,980	1,220	2,320	1,370
Stocks, National Defense Stockpile, December 31:						
Iridium, Ir content	do.	18	18	18	18	18
Platinum, Pt content	do.	261	261	261	261	261
Price, average:						
Iridium[3]	dollars per troy ounce	444.43	448.34	420.40	642.15	1,035.87
Palladium[4]	do.	357.34	355.12	265.65	530.61	738.51
Platinum[4]	do.	1,308.44	1,578.26	1,207.55	1,615.56	1,724.51
Rhodium[4]	do.	6,203.09	6,533.57	1,591.32	2,459.07	2,024.35
Ruthenium[3]	do.	573.74	324.60	97.28	198.45	165.85
Employment		1,630	1,360	1,270	1,350	1,570
World, mine production[e], PGM content	kilograms	509,000 r	468,000	447,000 r	466,000 r	484,000

[e]Estimated. [r]Revised. do. Ditto.

[1]Data are rounded to three significant digits, except prices.

[2]Source: Stillwater Mining Co., 2011 annual report, p. 53.

[3]Price data are annual averages of daily Engelhard unfabricated quotations published in Platts Metals Week.

[4]Price data are annual Engelhard unfabricated quotations published in Platts Metals Week.

TABLE 2
U.S. IMPORTS FOR CONSUMPTION OF PLATINUM, BY COUNTRY[1]

Country	Grain and nuggets		Sponge		Other unwrought		Other		Waste and scrap		Coins	
	Quantity, Pt content (kilograms)	Value (thousands)	Quantity, Pt content (kilograms)	Value (thousands)	Quantity, Pt content (kilograms)	Value (thousands)	Quantity, Pt content (kilograms)	Value (thousands)	Quantity, Pt content (kilograms)	Value (thousands)	Quantity, Pt content (kilograms)	Value (thousands)
2010	644	$16,700	31,700	$1,590,000	3,790	$151,000	4,650	$183,000	111,000	$565,000	46	$2,760
2011:												
Argentina	--	--	--	--	3	208	--	--	12	782	--	--
Australia	--	--	--	--	(2)	4	933	51,700	206	9,040	1,070	59,700
Belgium	--	--	2,340	130,000	--	--	17	878	37	2,050	--	--
Bolivia	--	--	--	--	--	--	--	--	9,770	1,150	--	--
Brazil	--	--	16	777	--	--	(2)	27	557	23,100	--	--
Canada	12	580	--	--	17	495	244	13,600	11,700	62,200	112	6,170
Chile	--	--	--	--	--	--	--	--	6,930	5,870	--	--
China	25	845	--	--	--	--	4	192	727	19,400	(2)	15
Colombia	5	211	--	--	1,440	66,600	(2)	2	348	9,350	--	--
Czech Republic	--	--	--	--			40	1,200	1	232	--	--
France	--	--	--	--	33	871	(2)	18	643	23,600	--	--
Germany	1	28	2,290	112,000	4,570	91,000	2,600	99,100	28,100	255,000	(2)	3
India	--	--	18	904	--	--	--	--	145	8,070	--	--
Indonesia	--	--	--	--	--	--	(2)	19	24	1,380	--	--
Israel	--	--	--	--	--	--	--	--	56	2,390	--	--
Italy	--	--	2,500	139,000	16	636	57	3,020	193	6,280	--	--
Japan	--	--	641	32,300	128	3,860	68	1,760	11,300	106,000	--	--
Jordan	--	--	--	--	--	--	--	--	52	1,150	--	--
Korea, Republic of	--	--	251	12,200	1	30	3	154	823	39,000	--	--
Malaysia	--	--	--	--	--	--	--	--	1,390	16,700	--	--
Mexico	1	35	8	409	66	3,620	10	485	1,520	83,000	--	--
Netherlands	--	--	--	--	1	93	4	91	43	2,340	--	--
Norway	--	--	1,440	79,200	--	--	--	--	5	271	--	--
Poland	--	--	--	--	80	3,010	1	48	--	--	--	--
Russia	114	6,480	588	26,500	57	3,170	50	2,530	--	--	--	--
Singapore	(2)	2	27	1,330	543	26,800	167	8,240	1,230	56,500	--	--
South Africa	1,050	56,600	19,400	1,030,000	99	5,670	--	--	4	128	--	--
Switzerland	11	282	446	23,600	16	749	248	6,250	(2)	14	(2)	14
Taiwan	--	--	--	--	30	1,680	--	--	1,330	28,200	--	--
United Kingdom	13	594	5,860	320,000	51	2,330	305	15,300	1,120	50,200	16	424
Other	(2)	17	--	--	7	409	45	1,060	586	18,200	--	--
Total	1,230	65,700	35,800	1,910,000	7,160	211,000	4,800	206,000	78,900	832,000	1,200	66,300

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 3
U.S. IMPORTS FOR CONSUMPTION OF PLATINUM-GROUP METALS, BY COUNTRY[1]

Country	Unwrought palladium		Palladium, other		Iridium[2]		Osmium[2]		Ruthenium[2]		Rhodium[2]	
	Quantity, Pd content (kilograms)	Value (thousands)	Quantity, Pd content (kilograms)	Value (thousands)	Quantity, Ir content (kilograms)	Value (thousands)	Quantity, Os content (kilograms)	Value (thousands)	Quantity, Ru content (kilograms)	Value (thousands)	Quantity, Rh content (kilograms)	Value (thousands)
2010	64,400	$990,000	6,310	$122,000	3,530	$65,900	76	$612	14,100	$82,500	12,800	$914,000
2011:												
Austria	8	159	122	2,990	--	--	--	--	19	109	1	65
Belgium	849	20,600	40	931	234	6,170	--	--	156	880	867	56,500
Canada	846	25,500	2,070	55,700	--	--	--	--	--	--	--	--
China	24	776	27	519	(3)	5	8	61	--	--	2	92
Germany	6,660	153,000	1,200	6,780	344	9,770	--	--	2,320	12,800	1,230	72,400
Hong Kong	20	526	--	--	--	--	--	--	--	--	--	--
Israel	--	--	49	334	--	--	--	--	--	--	--	--
Italy	1,470	35,700	77	1,840	55	479	--	--	--	--	166	12,200
Japan	2,610	36,800	293	4,020	8	229	--	--	213	829	165	10,500
Korea, Republic of	66	1,420	--	--	--	--	--	--	--	--	--	--
Norway	4,360	98,300	240	6,020	--	--	--	--	--	--	110	6,640
Poland	--	--	8	265	--	--	--	--	--	--	--	--
Russia	38,100	765,000	4,870	116,000	--	--	--	--	70	322	912	57,300
Singapore	--	--	--	--	--	--	--	--	(3)	9	55	3,740
South Africa	22,900	537,000	724	17,500	1,670	34,600	40	200	8,490	44,400	8,580	570,000
Switzerland	3,550	88,400	448	10,900	--	--	--	--	--	--	--	--
United Kingdom	5,570	127,000	1,720	43,400	571	8,120	--	--	1,960	10,000	973	55,500
Other	3	56	4	149	2	42	--	--	--	--	--	--
Total	87,000	1,890,000	11,900	268,000	2,880	59,400	48	261	13,200	69,300	13,100	844,000

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Unwrought and other forms.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 4
U.S. EXPORTS OF PLATINUM-GROUP METALS, BY COUNTRY[1]

Country	Palladium		Platinum		Platinum, waste and scrap		Iridium, osmium, ruthenium		Rhodium	
	Quantity, Pd content (kilograms)	Value (thousands)	Quantity, Pt content (kilograms)	Value (thousands)	Quantity, Pt content (kilograms)	Value (thousands)	Quantity, gross weight (kilograms)	Value (thousands)	Quantity, Rh content (kilograms)	Value (thousands)
2010	38,100	$419,000	16,900	$775,000	38,200	$1,100,000	3,720	$36,800	2,320	$136,000
2011:										
Argentina	--	--	53	2,850	--	--	--	--	--	--
Australia	751	8,960	427	24,100	--	--	39	446	--	--
Austria	93	895	41	1,380	3	73	--	--	(2)	16
Belgium	17	104	164	6,940	1,180	11,000	1	3	191	6,240
Brazil	235	6,080	36	2,060	--	--	--	--	66	2,890
Canada	2,790	39,800	411	20,400	47	1,380	8	125	(2)	61
Chile	3	15	92	5,520	--	--	(2)	6	--	--
China	2,900	71,600	45	1,760	351	19,400	178	1,360	288	18,100
Colombia	162	1,220	60	848	--	--	--	--	--	--
Czech Republic	629	1,360	--	--	--	--	--	--	--	--
Denmark	159	1,810	(2)	8	--	--	--	--	--	--
France	408	4,120	55	1,350	3	69	4	64	--	--
Germany	2,930	31,400	2,840	148,000	58,900	186,000	45	1,460	218	15,400
Hong Kong	2,380	20,400	452	21,400	2	81	55	973	126	6,400
India	510	4,270	413	22,600	--	--	12	247	2	154
Ireland	62	389	222	8,780	--	--	16	110	--	--
Israel	2,420	14,200	44	1,380	--	--	1	28	(2)	4
Italy	1,210	19,200	822	44,400	483	12,100	--	--	281	9,060
Japan	2,030	29,300	1,730	67,600	8,150	66,400	54	794	147	11,500
Korea, Republic of	1,320	14,800	465	26,300	--	--	267	1,800	13	866
Laos	--	--	33	1,790	--	--	--	--	--	--
Mexico	240	1,150	409	15,200	--	--	5	152	1	140
Netherlands	60	433	20	1,050	2	7	1	5	--	--
New Zealand	334	1,580	1	165	--	--	--	--	--	--
Norway	153	1,140	13	293	--	--	--	--	--	--
Russia	1	12	120	4,920	--	--	--	--	--	--
Saudi Arabia	133	766	(2)	8	--	--	--	--	--	--
Singapore	486	2,710	322	17,000	4	272	126	1,720	31	779
Slovakia	--	--	95	4,640	--	--	--	--	--	--
South Africa	39	257	1	35	2,960	31,900	--	--	--	--
Spain	169	1,130	--	--	--	--	--	--	--	--
Switzerland	1,220	21,900	1,070	61,100	18,000	240,000	(2)	14	--	--
Taiwan	1,820	18,100	53	2,430	2	19	91	538	--	--
Thailand	196	2,540	6	1,210	--	--	--	--	(2)	17
United Arab Emirates	13	169	125	4,930	1	24	4	23	(2)	7
United Kingdom	5,940	92,300	582	26,800	28,200	873,000	239	8,100	1	58
Other	205	1,540	104	3,020	2	94	7	63	(2)	21
Total	32,000	416,000	11,300	552,000	118,000	1,440,000	1,150	18,000	1,370	71,700

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 5
PLATINUM-GROUP METALS: ESTIMATED WORLD PRODUCTION, BY COUNTRY[1, 2]

(Kilograms)

Country[3]	2007	2008	2009	2010	2011
Palladium:					
Australia[4]	600	580	800 r	650 r	600
Botswana	5,000	3,000	3,000	3,000 r	3,000
Canada	14,100	14,700	7,000 r	6,200 r	14,000
Finland	NA	342 5	560 5	1,493 5	1,058 5
Japan[5, 6]	6,505 r	7,526 r	6,675 r	6,107 r	7,534
Poland[7, 8]	15	15	15	15	15
Russia	96,800	87,700	83,200 5	84,700	86,000
Serbia	15	70 r	38 r	22 r	25
South Africa	83,643 5	75,537 5	75,117 r, 5	82,222 5	82,000
United States[5, 9]	12,800	11,900	12,700	11,600	12,400
Zimbabwe	4,180 5	4,386 5	5,680	7,000	8,200
Total	224,000 r	206,000 r	195,000 r	203,000 r	215,000
Platinum:					
Australia[4]	142	120	230 r	130	130
Botswana	700	600	600	600 r	600
Canada	8,000	8,500	4,000 r	3,600 r	7,000
Colombia[5]	1,526	1,369	929	998	1,231
Ethiopia[10]	5 5	10 5	10 r	8 5	-- 5
Finland	461 r, 5	214 r, 5	265 r, 5	500 r	400
Japan[5, 6]	1,000 r	1,442 r	1,417 r	1,331 r	1,765
Poland[7, 8]	25	25	25	25	25
Russia	27,000	25,000	24,500	25,000 r	25,000
Serbia	2	-- r	12 r	-- r	--
South Africa[5]	160,940	146,140	140,819	147,790	145,000
United States[5, 9]	3,860	3,580	3,830	3,450	3,700
Zimbabwe	5,306 5	5,642 5	6,849 r, 5	8,800	10,600
Total	209,000	193,000	183,000 r	192,000	195,000
Other platinum-group metals:					
Canada	900 r	1,000 r	400 r	400 r	600
Russia	14,500	12,500	11,900	12,000	12,500
South Africa[5]	59,449	53,999	55,456	57,292	59,000
Zimbabwe	1,695 5	1,804 5	800	1,300	1,700
Total	76,500 r	69,300 r	68,600 r	71,000 r	73,800
Grand total	509,000 r	468,000	447,000 r	466,000 r	484,000

rRevised. NA Not available. -- Zero.

[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through May 20, 2012. Platinum-group metal (PGM) production by Germany, Norway, and the United Kingdom is not included in this table because the production is derived wholly from imported metallurgical products and to include it would result in double counting.

[3]In addition to the countries listed, China, Indonesia, and the Philippines are thought to produce PGM, and several other countries may also do so, but output is not reported quantitatively, and there is no reliable basis for the formulation of estimates of output levels. A part of this output not specifically reported by country is, however, presumably included in this table credited to Japan.

[4]PGM recovered from nickel ore that is processed domestically. PGM in exported nickel ore are extracted in the importing countries, such as Japan, and are thought to be included in the production figures for those countries.

[5]Reported figure.

[6]Production derived entirely from imported ores.

[7]Based on official Polish estimates.

[8]Estimates based on reported platinum- and palladium-bearing final (residual) slimes and then average platinum and palladium content from electrolytic copper refining.

[9]A very small quantity of byproduct platinum and palladium produced from gold-copper ores was excluded.

[10]Data for the Ethiopian calendar year ending July 7 of that stated. Yubdo Mine only. Platinum was also reportedly contained in gold ingots from the Lega Dembi Mine, but information is inadequate to estimate output.