Diamonds

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INTRODUCTION

World production of natural rough diamonds in 1994, the latest year for which statistics are available, was 111 million carats (Mct). This compares with 105 Mct in 1993 and 106 Mct in 1992. About two thirds of world sales by value of rough diamonds are marketed by the Central Selling Organization (CSO) established by De Beers in support of its "single-channel" marketing of diamonds. CSO sales of rough diamonds in 1995 were US$4.53 billion, compared with US$4.25 billion in 1994 and US$4.37 billion in 1993. While sales decreased slightly in the first half of the year compared with the previous year, they increased substantially during the second half.

Major events in 1995 included: the continuing surplus of lower quality rough diamonds; record sales of rough diamonds by the CSO; the extension of the CSO-Russian contract until February 1, 1996; record high exports at most diamond-cutting centres but continued low profitability; and continued problems concerning direct sales of rough diamonds by Russia. The CSO decreased the price of lower-range rough diamonds by 11% and later announced an increase in the price for rough gem diamonds 2 ct and larger by an average of 5%; however, Argyle claimed that the price reduction affected all diamond sizes, qualities and colours except those over 2 ct. CRA, which owns part of the large Argyle diamond mine in Australia, announced it would merge with RTZ, which owns Kennecott, to form one of the world's largest mining groups. In addition, the Bangkok Diamonds & Precious Stones Exchange became the 23rd member of the World Federation of Bourses.

World trends indicate that in 1995 retail sales of diamond jewellery were up by 5% compared with 1994. Sales of diamond jewellery continued to be strong in most countries of Southeast Asia. The retail market in the United States and Japan was up, while the picture in Europe remained mixed.

Canada currently is not a commercial producer of natural diamonds. However, Canada's potential to become a producer was further defined during the year as several companies continued extensive exploration and development work at a number of locations.

CANADIAN DEVELOPMENTS

A large area of northern and central Canada is underlain by a huge craton, which forms the nucleus of the North American continent. (A craton is part of the earth's crust and upper mantle that has attained stability, has been little deformed over a prolonged period of time, and has segments that are very old.) Studies of the global distribution of diamond-bearing rocks known as kimberlites show that these rocks are mainly confined to ancient cratons such as the one found in Canada. In addition, diamonds and diamond-indicator minerals (e.g., subcalcic high-chrome garnet, chrome diopside, high-magnesia ilmenite, and high-chrome chromite) have been found in glacial deposits in numerous locations in Canada. Together these observations suggest that, given sufficient time and funds for exploration, the chances of discovering diamonds in Canada in commercial quantities are very good.

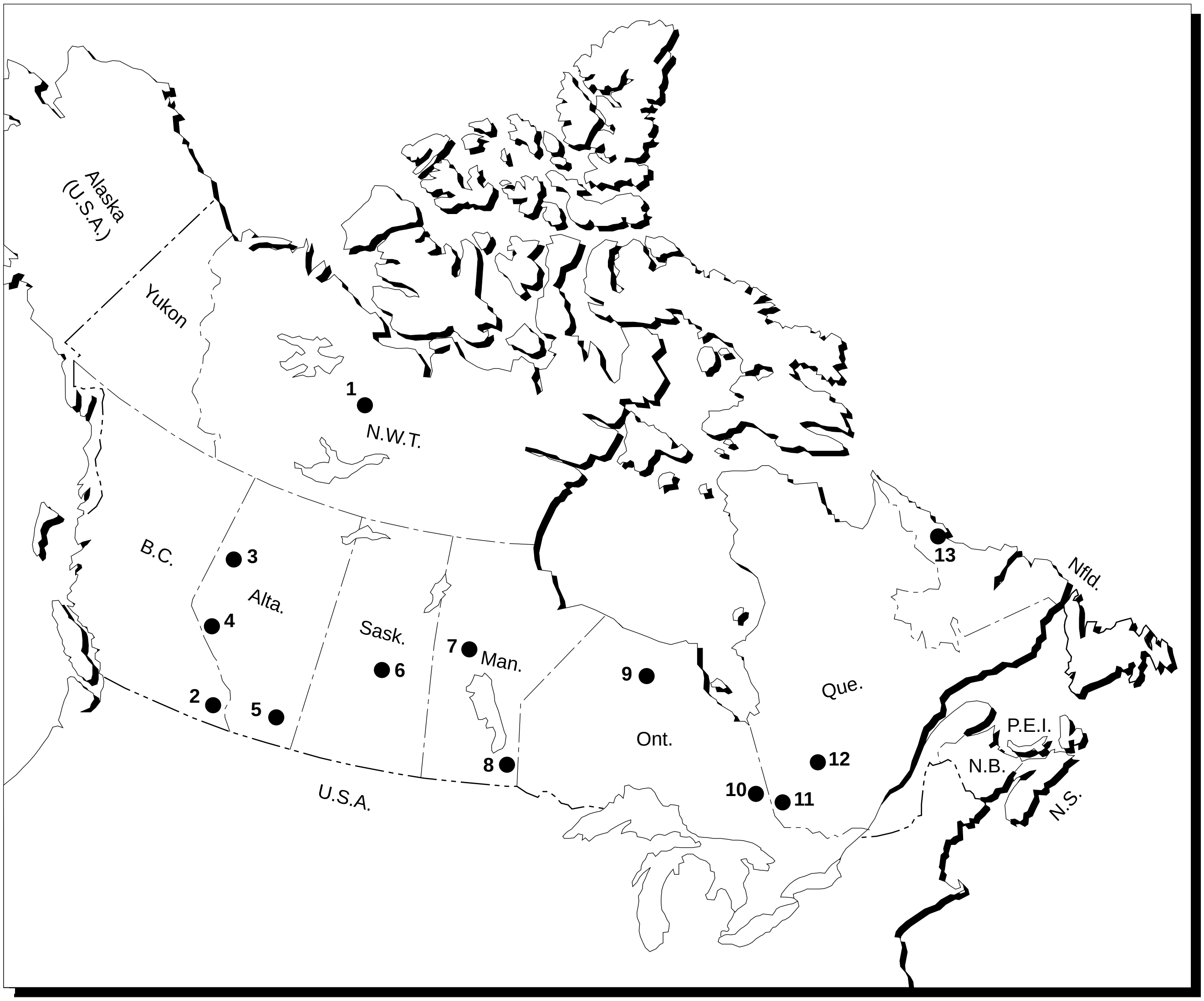
In 1995, exploration for diamonds continued, especially in the Northwest Territories, but also in Saskatchewan, Quebec, Alberta, Ontario, British Columbia, Manitoba and Labrador.

The most active companies, all in the Northwest Territories, in decreasing order were BHP/Dia-Met, Kennecott/Aber, and Mountain Province Mining Inc. Other active companies included Ashton Mining of Canada Inc., Winspear Resources Ltd./CRA Ltd., and Monopros Limited (a division of De Beers).

BHP Diamonds Inc. has reported that the diamonds recovered to date from five kimberlite pipes at its Lac de Gras property, located about 300 km northeast of Yellowknife, compare favourably with those at other diamond mines in the world. The company has stated that, at today's prices for rough diamonds, the project to develop the pipes is economically feasible. Its capital investment is expected to be in excess of US$500 million.

Figure 1

Major Diamond Exploration Areas in Canada, 1995



Numbers refer to locations on map above.

1. Lac de Gras
2. Southeastern British Columbia
3. Peace River
4. Jasper
5. Badlands
6. Prince Albert
7. Snow Lake
8. Southeastern Manitoba
9. James Bay Lowlands
10. Kirkland Lake
11. Temiscamingue
12. Desmaraisville
13. Northern Labrador

The five pipes, which are located under lakes that bear the same name, are known as Panda, Misery, Koala, Fox and Leslie. The lakes will have to be drained before mining can start. The pipes will be mined over approximately a 25-to-30-year period. Four pipes, starting with Panda to the northeast, followed by Koala, Leslie and Fox, are aligned almost in a straight line a few kilometres from each other in the watershed north of Lac de Gras. The fifth pipe, Misery, is located 27 km to the southeast, adjacent to Lac de Gras. The Panda open-pit would be developed first, followed by Misery (open-pit), Koala (open-pit), Panda (underground), Fox (open-pit), Leslie (open-pit), and Koala (underground). The preliminary results on four pipes are as follows: Panda, 0.95 ct/t evaluated at an average of US$130/ct, for a value of US$123/t of ore; Misery, 4.19 ct/t at an average of US$26/ct, for a value of US$109/t of ore; Koala, 0.95 ct/t at an average of US$122/ct, for a value of US$116/t of ore; and Fox, 0.27 ct/t at an average of US$125/ct, for a value of US$34/t of ore. It is worth mentioning that the pipes were evaluated before the CSO price change, and that selling prices may be substantially different than the evaluated prices, especially for small rough diamonds which are currently in surplus in the world.

The processing plant will receive 9000 t/d of ore during the first nine years of operation and 18 000 t/d of ore thereafter. The cut-off grade will be a 1.0-mm particle size (equivalent to about 0.01 ct). A single, centralized processing plant will be located southwest of the Koala pit. Processing will involve mainly crushing, scrubbing and dense media separation, plus some high-intensity magnetic separation and X-ray concentration, as well as sorting. No chemicals will be used in the process and the waste rock, it is reported, has a negligible potential for acid generation. The mine and processing plant will operate 24 hours per day, 365 days per year. The work force during construction will reach 1000 at its peak. Production will initially employ a total of approximately 650 workers, of which 400 will be on shift and housed in a camp facility at the mine and processing plant site.

It was announced during the year that a “Centre National du Diamant du Quebec” will be built at Boisbriand near Montréal at an estimated cost of $6.9 million. Construction is expected to begin in mid-to-late 1996. The Centre will include a diamond-cutting factory that will use the most recent technology; it is expected to employ between 45 and 60 workers within three years, and will be open to the public.

WORLD PRODUCTION

Natural Diamonds

An estimated 5000 kimberlite and lamproite pipes have been identified in the world, of which between 300 and 500 contain diamonds. Of this number, less than 50 have proven to be commercial, and 25 have become major producers. Currently, 16 are producing mines. As noted earlier, world production of natural rough diamonds in 1994 was estimated at 111 Mct. Of the total production, about 58 Mct consisted of low-value industrial diamonds, 35-40 Mct were near-gems, and 15-20 Mct were gem-quality diamonds. Depending on the source, the value of production is estimated at between US$6.0 billion and $7.0 billion. In terms of value, however, gems represent some 75% of the total, while near-gems represent about 20% and industrial, 2-5%. World production of natural diamonds grew from 43 Mct in 1980 to 111 Mct in 1994, representing an increase of close to 5 Mct/y. A large proportion of this increased production was absorbed through increased sales to Japan during the 1980s. The number of stones larger than 1 ct produced each year is very small and, according to De Beers, only 380 000 stones weighing over 1 ct each were produced in 1993 (the latest year for which statistics are available); the total weight of the stones was 510 000 ct (0.46% of world production) for an average of 1.34 ct per stone.

Natural diamonds are currently produced by some 20 countries. However, almost 95% of world production by weight has come from only five countries in recent years. They are, in decreasing order, Australia (38-43 Mct), Zaire (15-19 Mct), Botswana (15-17 Mct), Russia (11-18 Mct) and the Republic of South Africa (8-10 Mct). In terms of value, the three largest, in decreasing order, are Botswana, Russia, and the Republic of South Africa. Other large producers are Zaire, Namibia, Australia, and Angola.

Australia and Zaire account for 50-55%, by weight, of world production; however, more than 90% of their production consists of low-value industrial and near-gem diamonds. Therefore, the recent announcement by the CSO to decrease the price of lower-grade goods will affect these two countries the most. Diamonds mined in recent years have averaged about US$10/ct in Australia and US$18-$30/ct in Zaire. At the other end of the scale, Namibia, which produces less than 2% by weight of world production, has a very high proportion (+95%) of gem-quality diamonds averaging close to US$300/ct.

Grade (the weight of diamonds expressed as carats per tonne (ct/t) of ore) varies widely from one mine to another. However, the grade generally falls between 0.3 and 1.3 ct/t. Grades as low as 0.05 ct/t and as high as 7.0 ct/t have been exploited. The value of the ore per tonne equals the grade times the average value per carat of all the individual diamonds.

Diamonds are mined from pipes (mainly kimberlites, but also lamproites), from alluvial deposits, and from beach and offshore (marine) deposits. During the transport of alluvial materials, the weak portions (cracks, inclusions, and other defects and impurities) of the diamonds are removed. This means that the gem ratio increases with transport and that, as a result, beach and offshore deposits usually have the highest gem ratio. Currently, there are less than 20 pipes being mined in the world in the following countries: Australia, Botswana, Russia, the Republic of South Africa, Tanzania and Zaire. Nearly two thirds of the world's production by weight comes from only five pipes situated in Botswana (Jwaneng, Orapa), Russia (Udachny), the Republic of South Africa (Venetia), and Australia (Argyle).

Synthetic Diamonds

Synthetic diamonds compete with natural industrial diamonds as an abrasive mineral and with silicon carbide (SiC), alumina (Al_2O_3), and cubic boron nitride (CBN) as a manufactured abrasive material. World production of synthetic diamonds in 1994 was estimated by the U.S. Bureau of Mines at 440 Mct. The value of world synthetic diamond production is estimated at US$650 million-$800 million. Most marketed synthetic diamonds are 0.6-0.8 mm and smaller. A very popular type (about 80% of the total value) of synthetic diamonds is called Saw Diamond Abrasives (SDA); this type is used for sawing, drilling or milling hard stones, concrete aggregate, refractory materials, masonry and asphalt. Synthetic diamonds were invented in Sweden in 1953 and have been produced commercially since the late 1950s.

The production of synthetic diamonds using high-pressure and high-temperature methods is labour-intensive. Industry sources indicate that a plant with an annual capacity of 10 Mct requires about 60-70 employees, and a plant with an annual capacity of some 50 Mct requires about 160-170 employees. In such a plant, high-purity graphite powder, either natural or synthetic, is mixed with a metal (nickel or iron) powder alloy that serves as a solvent. At high temperature and pressure, liquid nickel dissolves about 4% of carbon from graphite, which is metastable. The solubility of carbon from diamond being only 3.6%, the difference cannot stay in solution and begins to crystallize out as the form of carbon stable, which is diamond. One large press of 10 000 t produces about 5-6 Mct/y of synthetic diamonds. After each run, which lasts 15-20 minutes, the metal alloy is dissolved in acid, thus releasing the diamond crystals. The diamonds are then separated by size, usually by selective settling in a heavy liquid. The shape (cube, mixed cube and octahedron, octahedron, etc.) of the diamonds depends on the temperature used in the process. The cube is a low-temperature shape and the octahedron is a high-temperature shape. The size and mechanical properties, such as the friability of the diamonds, depend on the following: reaction time; temperature; pressure; type, quality and purity of graphite; and the metal solvent used. Contrary to competing abrasive materials such as silicon carbide and alumina, the production of synthetic diamonds is not electricity-intensive, and the electricity is used mainly to raise the temperature in the presses to about 1800°C.

In 1994, synthetic diamonds were produced in some 16 countries. The most important producing countries were, in decreasing order of importance, the United States, Russia, the Republic of South Africa, Ireland, Japan, Belarus, Sweden, Germany and China. Smaller plants exist in Serbia, Slovakia, Romania, France, England, Korea and Greece. The two leading producers are De Beers of South Africa and General Electric of the United States. Each company controls approximately 40% of world production, and both produce a full range of synthetic diamond products. The smaller producers specialize in certain sizes and types of products. Tomei of Japan and Winters of Germany reportedly produce high-quality diamonds. De Beers has plants near Johannesburg in the Republic of South Africa, at Robertsfors in Sweden, and in Shannon, Ireland. General Electric has plants at Worthington, Ohio, and in Dublin, Ireland. Canada does not produce synthetic diamonds using the high pressure method, but Canada could become a producer because it is an important consumer.

The consumption of synthetic diamonds continues to grow in the world at a very healthy rate of about 12%/y as the industry conversion to super-abrasives continues. Although they are expensive when compared with competing materials such as silicon carbide and alumina, synthetic diamonds are more cost-effective because they cut much faster and last much longer. In many applications, synthetic diamonds are preferred to natural industrial diamonds because they can be tailored (size and shape) to the customer's needs. In addition, synthetic diamond grit outlasts natural grit in most cases because, unlike synthetic grit, natural diamonds must be powdered in a pestel and mortar to yield grit, a process which involves severe shock and attendant cracking. The cracks are points of weakness and result in grit losses when used for cutting or grinding rocks, concrete, etc. There are many types of synthetic diamonds, including those coated with metals such as copper or nickel for specific applications. Super-abrasives include synthetic diamonds, cubic boron nitride (CBN), polycrystalline synthetic diamond shapes (PDS), and compacts (PDC). More than 60% of all abrasive products used in Japan have diamond components, compared with about 40% in Europe and some 30% in North America. For Canada, the gradual conversion from traditional abrasives (alumina and silicon carbide) to newer and better-performing super-abrasives is slowly eroding markets for traditional abrasives that Canada currently produces.

Because of their declining prices and technical superiority in industrial applications, synthetic diamonds continue to replace natural industrial-grade diamonds. The latter already make a relatively insignificant contribution to the revenue of most diamond mines. However, since they are recovered along with gem-quality diamonds, mines will continue to produce and sell industrial-grade diamonds.

Crystalline Manufacturing Ltd. of Calgary produces synthetic diamond films by the Chemical (also called Carbon) Vapour Deposition (CVD) method at a plant in Calgary, Alberta, that was built in 1993 at a cost of some $4 million, excluding research and development. The process uses methane gas, argon and electricity as the key raw materials. A high-temperature hydrogen plasma is used to activate the methane which condenses as diamond and prevents any subsequent conversion of the diamond to graphite. Large quantities of electricity are required in the process. Target markets are thermal management and wear applications.

Major producers of industrial CVD products in the world are, in decreasing order, Sumitomo, De Beers, General Electric, St. Gobain (Norton), and

Crystallume. Other important producers are Diamonex (Monsanto), SI Diamond Tech, Asahi, Astex, ATM, Cemecon, Idemitsu, Mitsubishi, Nachi-Fiji, and Toshiba. World sales of CVD diamonds are estimated by General Electric at less than US$50 million. The industry reports that growth has slowed in recent years due to competition from polycrystalline synthetic diamonds. CVD products are used in three major fields of applications: (1) coatings on tools subject to wear; (2) optical-quality films (diamond is very hard and transparent to X rays, infrared light and visible light); and (3) heat sinks and electronic substrates (diamond dissipates thermal energy very rapidly and has a heat conductivity five times that of copper). Future growth is expected to be in the computer, medicine, and thermal management fields.

CANADIAN TRADE AND CONSUMPTION

Canada's imports of gem-quality and industrial diamonds were valued at $211 million in 1990, $189 million in 1991, $187 million in 1992, $173 million in 1993, $215 million in 1994, and $175 million in 1995. Some 90% of the imports were estimated to be gem-quality diamonds. Imports of synthetic diamond dust or powder were 5.92 Mct valued at $4.64 million in 1990, 7.36 Mct valued at $4.45 million in 1991, 5.32 Mct valued at $4.24 million in 1992, 2.11 Mct valued at $5.38 million in 1993, 3.36 Mct valued at $8.60 million in 1994, and 3.74 Mct valued at $11.09 million in 1995.

THE DIAMOND-CUTTING INDUSTRY

Natural diamonds are cut in some 30-40 countries. The major diamond-cutting centres in the world are Surat and Bombay, India; Ramat-Gan and Tel-Aviv, Israel; Kempen and Antwerp, Belgium; and New York City. With the exception of India, which is a very small producer of diamonds, none of these countries mine diamonds. Other countries with important cutting centres include the Republic of South Africa, Russia, Ukraine, Belarus and Uzbekistan. Newcomers include Australia, Thailand, China, Botswana, Sri Lanka, Indonesia, Malaysia and, more recently, Yakutia in Russia. Many other countries also cut diamonds, but their industries are small. Belgium is known as the world's largest trading centre for rough and polished diamonds with a value of US$21 billion and 209 Mct traded in 1995 compared to US$18.5 billion and 155 Mct traded in 1994; close to 50% of the CSO's sales go to Antwerp. India cuts more carats of rough diamonds than any other country and, in fiscal year 1994/95, was the largest exporter of polished diamonds with a value of US$4.02 billion (US$700 million in 1980), followed by Israel at US$3.8 billion in 1995 (US$3.5 billion in 1994). About 90% of Argyle's cuttable production is cut in India. It is reported that India accounts for 40% of the global sales of polished diamonds in dollar terms, and some 70% of the market in carat equivalent. Israel is the leader in diamond-cutting technology and cuts a very wide range of diamonds, while New York cuts the largest and best-quality stones.

In Russia, most production of rough diamonds comes from Yakutia. As Russia wants to maximize employment, more diamonds mined in Russia are now cut in Russia. It was reported that 7000 new jobs have been created in the Russian cutting industry over the past five years. While there were 7 state-owned plants in 1991, there are now more than 50 cutting enterprises under all forms of ownership, including joint ventures with Belgian and Israeli companies, among others. Yakutia has only recently established its own diamond-cutting industry and there are at least five cutting plants with capacities varying from 30 000 to 100 000 rough ct/y. The plants have been built as joint ventures with foreign companies. Several more plants are planned over the next few years. Yakutia sorts some of the diamonds it produces, with some being sold to its own cutting plants. A substantial portion of Russian production is exported as partially facetted (semi-processed) stones to non-CSO buyers.

Diamond-cutting is relatively labour-intensive in comparison with many other sectors. Automated cutting techniques are increasingly being used to compete with low-wage operations. The types of automated equipment being acquired include automatic girdling machines (sometimes connected with stroboscopes), automatic facetting machines, lasers to shape the roughs, and computers that suggest an optimal cut based on the shape and dimensions of, and inclusions in, a rough stone. More recently, automatic pre-blocking machines that cone 20-25 stones at a time have been introduced on the markets. If the pre-blocking machines are accepted by the industry, it is likely that most manual tasks up to the coning level will be eliminated in many factories.

Major diamond-cutting centres invariably have a very wide range of indirect jobs associated with them such as brokers, wholesalers, suppliers of machinery and equipment for cutters, bourses, insurance companies, travel agencies, jewellery manufacturing, etc.

It is reported that, on average, an employee cuts 800 rough ct/y. However, this number varies widely depending on the size of the rough diamonds to be cut (usually more carats can be cut from bigger diamonds), the difficulty of the cut, and the level of automation in the factory. Because of high labour costs, factories in the United States usually cut bigger and better-quality diamonds. Belgium and Israel are in the middle of the labour-cost spectrum and, as a consequence, are generally involved in cutting stones of intermediate size and quality. India, with the lowest labour costs, cuts the smallest and least expensive diamonds. It is also reported that the average price per carat of polished production from New York is about US$1400; from Antwerp, US$750; from Tel Aviv, US$720-$750; and from India, US$250.

Employment related to diamond-cutting varies widely from factory to factory, running anywhere from 1 to 3000 workers. Total employment in diamond-cutting varies widely from country to country. For example, there are 500-600 cutters in the United States; 3500 cutters (compared with 4000 in 1994) in 300 factories in Belgium; some 8000 cutters in 35 factories in Thailand (there were no factories in 1980); 8000 cutters (compared with 10 000 in 1994) in some 500 factories (600 in 1994) in Israel; approximately 10 000 cutters in some 50 factories in Russia; 1500-2000 cutters (4000 in the mid-1980s) in 150 factories in the Republic of South Africa; 10 000 cutters in 80 factories in China; and some 800 000 cutters in 30 000 factories in India.

The major steps in diamond-cutting are: (a) studying the stone to locate the flaws (i.e., inclusions and imperfections in the stone), and marking with a pen where the stone is to be cut; (b) sawing (to remove the flawed areas of the stone) with a saw impregnated with diamond dust or with a laser, or cleaving; (c) rounding or bruting (also known as girdling) to shape the diamond into a round, pear, oval or other form; (d) blocking, i.e., by grinding four facets on the top and four facets on the bottom of the stone; (e) facetting (also known as brillianteering) by grinding many more facets into the diamond; and (f) polishing to remove surface irregularities and allow more light to penetrate the stone.

CLASSIFICATION, VALUATION AND SALES PROCEDURES

Rough Diamonds

The major classification (sorting) centres at or near diamond mines are Kimberly, Republic of South Africa; Gabarone, Botswana; Windhoek, Namibia; Perth (2200 km away from the mine), Australia; and Mirny in Yakutia province, and Moscow (final sorting), Russia. De Beers' main sorting house is in London, England. De Beers also sorts rough diamonds in Lucerne, Switzerland.

Each diamond mine contains diamonds that are specific to the mine. The stones are classified according to their weight, shape, colour and clarity. The rough diamonds that are mined at different locations in the world and that are sold in whole or in part to the CSO are classified into a total of some 8000 categories by the CSO. This large sample, called the "master sample," is kept at the CSO's office in London, England. The CSO attaches a price to each category of roughs contained in the master sample. All the prices are contained in a proprietary price book that is used by the CSO's 600 sorters in London who sort and value all the incoming rough diamonds. The prices are changed in the book every time the CSO announces a price change.

A **simplified** method of classifying the stones from a specific deposit can be described as follows. Once the rough diamonds from a production run have been cleaned of their surface impurities with acids, they are weighed, counted, sieved for size (weight), and separated into 5 to 10 piles depending on the size distribution of the stones in the deposit. For small stones (i.e., smaller than 0.5 ct), weight is the most important classification factor. They are then classified according to their shape.

The major shapes in which gem-quality diamonds crystallize or are found in mines are:

(a) octahedron, or "O";

(b) triso-O, where each face of the "O" has been replaced by three triangular faces; hexa-O, where each face of the "O" has been replaced by six triangular faces; or combinations of the above;

(c) cleavages, which are broken crystals of the above shapes; and

(d) macles, which are twin crystals, often triangular in shape and thick; flats, which are thin pieces, whole or broken, including thin macles; and flat elongated crystals.

The yield of each type of shape is approximately as follows: type (a), 40-48%; type (b), about 50%; type (c), 35%; and type (d), 20-25%.

Colour can be classified into three categories "equivalent to polished stones": (1) H, "white," if the stone appears colourless; (2) J, "off-white," when the stone has a slight milky appearance; and (3) M, if the stone appears yellowish or brownish. Very few diamonds in a mine are D, E, F or G in colour "equivalent to polished stone."

Clarity is classified as follows:

- I, if inclusions can be seen with the naked eye;
- SI, if small inclusions are easy to see with a 10 X loupe;
- VS, if small inclusions are difficult to see with a 10 X loupe; and
- VVS, if small inclusions are very difficult to see with a 10 X loupe.

Consequently, gem-quality diamonds from a mine can be classified into 250-500 categories (piles). At some mines, such as alluvial mines, the number of categories is much less. Industrial stones only need to be classified in a few categories. After classification of a production run, each pile is weighed.

In a simplified way, the valuation of a production run can be described as follows. If the production is sold to the CSO, the value at the mine is determined by comparing the quality of the production run with those of a “working sample” that matches the “official producer sample” but consists of fewer stones. Usually, if the quality of the stones improves, the value also improves. The “official producer sample” consists of a few hundred stones (as described above), representative of the deposit, and for which an agreed-upon value “by the CSO, the mine and the government valuers” has been assigned when initial production started. The official producer sample is kept in London. The mine production is sold to the CSO at a price called the “realizable value” of production that is negotiated between the CSO, the mine and the government valuers. An independent valuer can also be used in the process. The realizable value is the value upon which taxes apply.

If the production is sold outside the CSO, the value can be determined by using published polished prices corresponding to each category of rough diamonds, then applying a discount that depends on supply/demand for certain category stones, and calculating back the value of the rough diamonds for each category. It is worth mentioning, however, that selling prices may be quite different than valuation prices because it is almost impossible to use discounts that reflect the exact market conditions.

The CSO has been successful in maintaining a balance between the supply of and demand for rough diamonds for some 60 years. It buys surplus production of rough diamonds from mines and stockpiles them during periods of weak demand in the jewellery market and sells off its stockpiled roughs as demand picks up. Production quotas may be applied to major producers when sales fall.

About two thirds of world sales by value of rough diamonds are marketed by the CSO and released to the market in a controlled way (to maintain a balance between the supply of and demand for different quality diamonds) by the CSO at “sights,” which are held about every five weeks in Europe (London and Lucerne) and South Africa to about 170-180 carefully chosen buyers known as “sightholders.” Some 35% of the sightholders reside in Belgium, 25% in India, 20-25% in Israel, about 10% in the United States, and 5% in the Republic of South Africa. The majority of the sightholders are manufacturers who cut and polish the stones in their factories, although some wholesale firms that deal in rough diamonds also attend the sights.

Once the stones are cut and polished, they are sold to diamond merchants or wholesalers of polished diamonds. Finally, the diamonds are in turn sold to manufacturing jewellers and retail outlets.

Cut and Polished Diamonds

To determine the value of an individual polished diamond, an appraiser looks at its combination of all the four “C”s: cut, colour, clarity, and carat (weight).

Cut

Polished diamonds come in a variety of shapes, the most common being round (also known as “brilliant”); other shapes (called “fancies”) include oval, pear, marquise, heart, square, or triangle. Polished stones also vary in terms of their number of facets (surface planes). However, more important than these two factors to the value of the diamond is the **quality** of its cut. This is determined by: (a) the relative proportions of the table size, the crown height, and the pavilion depth of the diamond (which determines its brilliancy, i.e., the amount of light reflected through the stone); and (b) the angles of the facets (which determine the dispersion of light that creates the fiery rainbow colours). The quality of the cut is also determined by: (a) the symmetry of the table and the girdle and the location of the cullet (base); and (b) the quality of the polish. By far the most popular cut diamond sold in the markets is the brilliant (58 facets). Fancy cuts represent about 10-20%, and single cuts known as 8/8 (17 facets) represent about 10%. Single cuts are for very small diamonds, i.e., three points and smaller. Single-cut stones are used to add scintillation around a large stone. Full-cut stones smaller than three points do not scintillate because the facets are too small.

Colour

The rarest and best colour in diamonds is no colour at all. The colour grade is a measure of the amount of colour present in a diamond. Most diamonds have a tinge of some colour (most often yellow or brown). Strong (intense)-coloured diamonds called “fancies” command very high prices. Among the fancies, the browns (cognac) are the most common, followed by champagne and intense canary yellow. Orange and yellowish greens are rare; pink, blue, and dark green are the rarest colours and command the highest prices.

Clarity

This is a measure of the number, size, placement, and nature of flaws (inclusions and/or imperfections) within and on the surface of a diamond visible at 10-power magnification. Inclusions are foreign minerals, while imperfections are feathers, blemishes, cracks, etc.

Carat

One carat is equivalent to 0.2 grams. A carat is normally divided into 100 points. Because larger diamonds are rare, a 1-carat diamond will cost more than a cluster of 20 diamonds weighing a total of 1 carat. A carat is also subdivided into “grains,” and one carat equals four grains. A one-carater therefore is also a four-grainer and refers to diamonds within a certain weight zone. A four-grainer weighs 0.95-1.05 ct, a three-grainer weighs 0.72-0.76 ct, a two-grainer weighs 0.47-0.56 ct, and a one-grainer weighs

0.23-0.26 ct. Melee are small diamonds that weigh 7-15 points.

USES

World retail sales of diamond jewellery in recent years have had a diamond content value of some US$9 billion and a diamond content weight of some 15-17 Mct. In 1993, De Beers reported that world retail diamond jewellery sales had a diamond content valued at US$9.1 billion. In 1994, some sources indicate that retail sales had a diamond content of US$10.5 billion. The major markets for diamond jewellery in 1993 in terms of diamond content value were approximately as follows: the United States, 32%; Japan, 23%; Europe, 13%; East Asia, 17%; and other countries, 15%. Since a considerable proportion of the rough stone is lost during cutting and polishing, only about 15-17% by weight of the rough stones mined ends up in jewellery. World retail sales of diamond jewellery were US$42.5 billion in 1993, were close to US$45 billion in 1994, and increased to more than $US47 billion in 1995. The East Asian market is growing steadily while, since the late 1980s, the markets of Europe, Japan and the United States have shown minimal growth.

Because they are the hardest substance known to man, natural and synthetic industrial diamonds are used in equipment that drill, cut, grind and polish rocks (such as granite and marble), other materials (such as nonferrous metals, carbon fibre and composites), and a range of nonmetallic materials (such as glass, refractories, ceramics, concrete, plastics and masonry bricks). Natural and synthetic diamonds are widely used in the automotive, advanced technology, and aerospace industries.

PRICES

Published average mine prices of rough diamonds in recent years varied widely across producing countries: US$7-$10/ct in Australia, US$18-$30/ct in Zaire, US$80-$105/ct in the Republic of South Africa, US$100/ct in Russia, US$100-$110/ct in Botswana, US$160-$180/ct in the Central African Republic, US$150-$200/ct in Guinea, US$160-$200/ct in Sierra Leone, US$160-$230/ct in Angola, and US$300/ct in Namibia. This wide variation in prices has been mainly a function of the proportion of gem-quality diamonds produced by each country. As an example, in Australia the diamonds have a very low gem ratio, while in Namibia the gem ratio is very high. South Africa produces rough diamonds that vary in price from US$30/ct to over $300/ct. In 1995, the average value of production of rough diamonds in the three major producing countries according to Terraconsult was as follows: US$84/ct in Botswana, US$89/ct in Russia, and US$105/ct in the Republic of South Africa.

According to different sources, operating costs (excluding depreciation and interest) for kimberlites and lamproites in the world are about US$10/t for large and easy-to-access diamond mines operating in good climatic conditions, and up to US$30/t for small mines located in remote locations and operating under harsh climatic conditions. Their total production costs are around US$20 and $40/t respectively.

Taking into account losses during cutting and polishing, as well as commissions paid to intermediaries, the price of a diamond sold to a jeweller is an estimated 5-6 times the price of the rough stone at the mine. Intermediary costs include those for advertising, sightholders' brokers, and wholesalers.

In 1993, the latest figures available indicate that the average value of U.S. imports of natural industrial diamond grit (40 microns to 1 mm) and powder (–40 microns), synthetic grit and powder, and industrial stones (>1 mm) was US$1.14/ct, US$0.64/ct and US$4.56/ct, respectively. The prices of synthetic diamonds vary widely: 10¢/ct for friable material with irregular shapes; $1-$2/ct for polishing material; several dollars per carat for blocky, regular shapes with good crystal structure; and several thousand dollars per carat for large crystals with excellent structure for use in specific applications. The popular SDA diamonds noted earlier sell for $1-$3/ct.

PRODUCTION AND CONSUMPTION FORECAST AND OUTLOOK

It is difficult to forecast world production and consumption of diamonds with certainty. Production by certain countries cannot be estimated with precision because: (a) the information released by their governments is often vague or inaccurate; (b) smuggling is common practice in some countries; (c) stockpiles of roughs held by the CSO are published only in dollar value (US$4.67 billion as of December 31, 1995) at cost, and not in carats; and (d) Russia has a stockpile of rough gems that remains unknown outside the country. Changes in either the CSO or Russian stockpiles can affect world prices and, consequently, production.

Bearing the above cautions in mind, some general comments can be made concerning future world diamond production. On the one hand, factors leading to a possible decline in production include: (a) the current rapid depletion of the reserves of certain mines in Russia and the Republic of South Africa; (b) the exhaustion of on-shore alluvial deposits in the Republic of South Africa and Namibia; (c) unstable conditions in certain countries of Africa, which are inhibiting production; and (d) a likely decline in production at the Argyle mine in Australia in the early years of the next century. On the other hand, the above factors may be partially or totally offset by the following major supply developments: (a) increased exploration in the world that may lead to a major discovery; (b) increased offshore production in the Republic of South Africa and Namibia; (c) the likely development of new mines in Canada and Russia; and (d) increased production of synthetic (industrial and gem-quality) diamonds.

On the consumption side, the growth in diamond sales in East Asia and China is expected to continue in response to increased advertising for diamond jewellery by De Beers, and increases in the Gross National Product per capita in these countries.

In the short term, the oversupply of small natural rough diamonds, especially in the lower-quality range categories, is likely to continue. Automation is increasing rapidly in the industry, which means that more polished stones can be produced. However, the consumption of diamonds in the Western World should increase as economies improve, and sales in Southeast Asian countries should continue to grow in line with their economies. After the year 2000, sales to Eastern Europe are expected to pick up.

Note: Information in this review was current as of January 31, 1996.

TARIFFS

Item No.	Description	Canada			United States
		MFN	GPT	USA	Canada
7102.10	Diamonds, unsorted, whether or not worked, but not mounted or set	Free	Free	Free	Free
7102.21	Diamonds, industrial, unworked or simply sawn, cleaved or bruted, but not mounted or set				
7102.21.10	Bort and black diamonds, for borers	Free	Free	Free	Free
7102.21.90	Other	Free	Free	Free	Free
7102.29	Diamonds, industrial, other, worked, not mounted or set				
7102.29.10	Bort and black diamonds, for borers	Free	Free	Free	Free
7102.29.90	Other	Free	Free	Free	Free
7102.31	Diamonds, non-industrial, unworked or simply sawn, cleaved or bruted	Free	Free	Free	Free
7102.39	Diamonds, non-industrial, other	Free	Free	Free	Free
7105.10.10	Diamond dust for borers; dust mixed with a carrier in cartridges or in tubes	Free	Free	Free	Free
7105.10.91	Natural diamond dust or powder	8.8%	5%	Free	Free
7105.10.92	Synthetic diamond dust or powder	Free	Free	Free	Free

Sources: Customs Tariff, effective January 1996, Revenue Canada; Harmonized Tariff Schedule of the United States, 1996.

TABLE 1. CANADA, DIAMOND TRADE, 1993-95

Item No.		1993		1994		1995p	
		(carats)	($000)	(carats)	($000)	(carats)	($000)
EXPORTS							
7102.10	Diamonds, unsorted, whether or not worked						
	United States	. .	226	. .	159	. .	320
	Total	. .	226	. .	159	. .	320
7102.21	Diamonds, industrial, unworked or simply sawn, cleaved or bruted						
	United States	–	–	6 298	39	4 069	26
	Total	–	–	6 298	39	4 069	26
7102.29	Diamonds, industrial, n.e.s., excluding mounted or set diamonds						
	United States	12	12	85	55	5 090	89
	Israel	–	–	–	–	12 000	82
	Ireland	100	12	–	–	1 800	18
	Switzerland	–	–	–	–	500	10
	Mexico	–	–	13 000	533	–	–
	Total	112	24	13 085	588	19 390	199
7102.31	Diamonds, non-industrial, unworked or simply sawn, cleaved or bruted						
	United States	111	10	–	–	345	44
	Total	111	10	–	–	345	44
7102.39	Diamonds, non-industrial, n.e.s., excluding mounted or set diamonds						
	Belgium	20	35	–	–	5 708	8 417
	United States	7 252	5 307	15 576r	11 734r	6 854	7 627
	Russia	–	–	–	–	886	1 181
	Hong Kong	11	21	81	57	392	803
	Other countries	–	–	2 656	5 300	154	390
	Total	7 283	5 364	18 313r	17 094r	13 994	18 420
7105.10	Diamond dust or powder						
	United States	128 168	196	167 675r	258	171 124	115
	Bulgaria	–	–	29 600	29	–	–
	Other countries	50	. . .	–	–	–	–
	Total	128 218	197	197 275r	287	171 124	115
IMPORTS							
7102.10	Diamonds, unsorted, whether or not worked, but not mounted or set						
	United States	. .	18 825	. .	15 365r	. .	10 811
	Belgium	. .	16 712	. .	8 991r	. .	6 636
	Israel	. .	11 705	. .	8 015r	. .	5 485
	India	. .	5 106	. .	4 909r	. .	4 096
	Barbados	. .	–	. .	440	. .	1 573
	Other countries	. .	3 550	. .	1 501r	. .	2 771
	Total	. .	55 905	. .	39 228r	. .	31 380
7102.21.10	Diamonds, industrial, bort and black, for borers, unworked or simply sawn, cleaved or bruted, but not mounted or set						
	United States	246 403	974	338 908	1 168	332 821	1 017
	Belgium	6 979	69	42 627	347	127 940	793
	Zaire	44 789	198	88 524	404	113 052	443
	Germany	–	–	–	–	87 342	254
	Ghana	3 640	34	15 673	151	42 080	240
	United Kingdom	1 021	10	18 106	79	33 233	194
	Ireland	–	–	135 673	508	40 998	186
	Other countries	3 982	14	43 417	279	36 402	222
	Total	306 814	1 301	682 928	2 945	813 868	3 358
7102.21.90	Diamonds, industrial, other than bort and black, for borers, unworked or simply sawn, cleaved or bruted, but not mounted or set						
	United States	2 347	21	3 879	38	6 252	62
	Other countries	643	5	19 000	89	3 331	32
	Total	2 990	28	22 879	127	9 583	95

TABLE 1 (cont'd)

Item No.		1993		1994		1995p	
		(carats)	($000)	(carats)	($000)	(carats)	($000)
IMPORTS (cont'd)							
7102.29.10	Diamonds, industrial, bort and black, for borers, worked, but not mounted or set						
	Ireland	601 466	2 348	659 211	2 312	305 256	1 000
	United States	56 369	202	49 936	230	101 918	344
	Zaire	37 027	152	46 726	155	38 123	152
	Other countries	4 083	13	11 069	121	27 683	131
	Total	698 945	2 717	766 942	2 822	472 980	1 631
7102.29.90	Diamonds, industrial, other than bort and black, for borers, worked, but not mounted or set						
	Ireland	20 432	143	41 493	199	176 494	561
	United States	2 041	12	1 587	14	14 590	259
	Other countries	–	–	1 000	5	7 022	45
	Total	22 473	156	44 080	219	198 106	868
7102.31	Diamonds, non-industrial, unworked or simply sawn, cleaved or bruted, not mounted or set						
	Belgium	21	21	912	224	466	526
	United States	44	16	296	180	281	185
	Israel	–	–	–	–	39	6
	Total	65	38	1 208	404	786	718
7102.39.00.10	Diamonds, non-industrial, worked, of a weight not exceeding 0.5 carat each						
	Israel	13 022	7 150	13 360r	8 858r	36 074	23 863
	Belgium	57 507	23 140	54 793r	25 256r	33 341	19 288
	United States	17 656	11 055	34 243r	23 196r	13 470	10 783
	Russia	36 905	11 949	22 487	6 894	4 552	4 345
	India	6 163	1 988	9 585r	4 122r	3 819	1 392
	Other countries	2 731	2 438	2 777r	2 330r	2 058	2 074
	Total	133 984	57 726	137 245r	70 665r	93 314	61 754
7102.39.00.20	Diamonds, non-industrial, worked, of a weight exceeding 0.5 carat each						
	Belgium	20 445	18 111	35 747r	29 250r	39 077	28 768
	Israel	9 227	9 962	18 118r	18 017r	38 976	22 495
	United States	7 919	8 962	16 185r	16 209r	12 922	10 287
	India	1 822	566	13 617r	4 530r	20 933	6 573
	Russia	10 684	15 731	20 088	27 181	2 382	2 828
	Other countries	1 265	1 452	2 916r	3 116r	3 670	3 918
	Total	51 362	54 794	106 671r	98 310r	117 960	74 879
7105.10.10	Diamond dust for borers; dust mixed with a carrier in cartridges or in tubes						
	United States	278 709	796	306 241	599	366 934	785
	Denmark	9 010	45	8 972	45	9 673	48
	Other countries	15 467	19	40 804	143	22 602	57
	Total	303 186	862	356 017	792	399 209	893
7105.10.91	Natural diamond dust or powder						
	United States	501	4	929	6	5 955	9
	Zaire	–	–	–	–	4 100	5
	Total	501	4	929	6	10 055	14
7105.10.92	Synthetic diamond dust or powder						
	United States	1 719 902	4 248	2 071 474r	5 428r	1 790 218	5 545
	Ireland	251 152	1 027	687 063r	2 527	1 463 147	4 072
	Italy	–	–	–	–	228 610	669
	Other countries	140 256	102	603 905	644	262 509	798
	Total	2 111 310	5 378	3 362 442r	8 602r	3 744 484	11 092

Source: Statistics Canada.
– Nil; . . Not available; . . . Amount too small to be expressed; n.e.s. Not elsewhere specified; p Preliminary; r Revised.
Note: Numbers may not add to totals due to rounding.

TABLE 2. DIAMONDS, WORLD PRODUCTION,[1,2] BY TYPE AND COUNTRY, 1991-94

Country	1991			1992			1993			1994		
	Natural			Natural			Natural			Natural		
	Gem[3]	Industrial	Total	Gem[3]	Industrial	Total	Gem[3]	Industrial	Total	Gem[3]	Industrial	Total
	(000 carats)											
Angola[4]	899	62	961	1 100	80	1 180	130[r]	15[r]	145[r]	270	30	300
Australia	18 000	18 000	36 000	18 100[r]	22 100[r]	40 200[r]	18 800[r]	23 000[r]	41 900[r]	19 500	23 800	43 300
Botswana	11 600	4 950	16 500	11 200	4 790	15 900	10 300[r]	4 420[r]	14 700[r]	11 000	5 000	16 000
Brazil	600	900	1 500[e]	653	665	1 320	600	900	1 500[e]	600	900	1 500
Central African Republic	296	82	378[r]	307	107	414	370[r]	125[r]	495[r]	370	125	495
China[e]	200	800	1 000	200	800	1 000	230	850	1 080	230	850	1 080
Gabon[e]	400	100	500	400	100	500	400	100	500	400	100	500
Ghana[e]	560	140	700	570	140	710	570[r]	140[r]	710[r,e]	580	145	725
Namibia	1 170	20	1 190	1 520[r]	30[r]	1 550	1 120[r]	20[r]	1 140	1 280	30	1 310[a]
Russia[e]	x	x	x	9 000	9 000	18 000	8 000	8 000	16 000	8 500	8 500	17 000
Sierra Leone[5]	160	83	243	180[r]	116[r]	296	90	68	158	155	100	255
South Africa, Republic of	3 800[r]	4 600[r]	8 430	4 600[r]	5 600[r]	10 200[r]	4 600[r]	5 700[r]	10 300	5 000	5 800	10 600[a]
U.S.S.R.[6,e]	10 000	10 000	20 000	x	x	x	x	x	x	x	x	x
Venezuela	102	112	214	302	176	478	145[r]	155[r]	301[r]	220	175	395
Zaire	3 000	14 800	17 800	8 930	4 570	13 500	2 010[r]	13 600[r]	15 600[r]	4 000	13 000	17 000
Subtotal	46 900	50 000	97 000	52 400	42 700	95 100	42 800	51 400	94 300	47 100	52 800	99 900
Other	4 080	4 770	8 870	4 880	5 800	11 300	4 860	5 900	10 800	5 230	5 910	11 200
Total	51 000[r]	54 800	106 000[r]	57 300[r]	48 500[r]	106 000[r]	47 700	57 300[r]	105 000[r]	52 300	58 700	111 000

Source: Natural Resources Canada.
[e] Estimated; [r] Revised; x Withheld to avoid disclosing company proprietary data.
[a] Reported figure.
[1] Previously published and 1994 data have been rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown. [2] Table includes data available through May 30, 1995. Total natural diamond output (gem plus industrial) for each country actually is reported, except where indicated by a footnote to be estimated. In contrast, the detailed separate production data for gem diamond and industrial diamond are U.S. Bureau of Mines estimates except for Brazil (1990) and the Central African Republic (1990-93), for which source publications give details on grade as well as totals. The estimated distribution of total output between gem and industrial diamond is conjectural and, for most countries, is based on the best available data at the time of publication. [3] Includes near-gem and cheap-gem qualities. [4] Figures do not include smuggled artisanal production. [5] Figures are estimates based on reported exports and do not include smuggled diamonds. [6] Dissolved on December 31, 1991.

TABLE 3. DE BEERS' CSO ROUGH DIAMOND SALES AND STOCKS, 1985-95

Year	Sales	Stocks
	(US$ billions)	
1985	1.80	1.90
1986	2.56	1.85
1987	3.07	2.30
1988	4.17	2.00
1989	4.09	2.47
1990	4.17	2.68
1991	3.93	3.03
1992	3.42	3.76
1993	4.37	4.12
1994	4.25	4.38
1995[p]	4.53	4.67

Sources: U.S. Bureau of Mines; American Diamond Industry Association.
CSO = Central Selling Organization.
[p] Preliminary.

TABLE 4. DIAMONDS, PRINCIPAL CUTTING CENTRES

Country	Type of Diamonds Cut: Near Gems[1]	Type of Diamonds Cut: Gems[2]
MAJOR CENTRES		
Belgium (Antwerp, Kempen)		√
United States (New York)		√
Israel (Ramat Gan, Tel Aviv)		√
India (Bombay, Surat)	√	√
Russia (Smolensk, Moscow)		√
Ukraine		√
INTERMEDIATE CENTRES		
Republic of South Africa		√
Thailand	√	√
China, People's Republic of	√	√
Sri Lanka	√	
MINOR CENTRES		
Armenia	√	√
Australia		√
Botswana		√
Brazil		√
Central African Republic	√	√
Puerto Rico	√	√
Hong Kong	√	√
Taiwan	√	√
South Korea	√	√
Japan		√
Singapore	√	√
Indonesia	√	√
Vietnam	√	
Malaysia	√	
Mauritius	√	

Sources: Natural Resources Canada; De Beers Centenary AG.
√ Minor production; √ Major production.
[1] Near gems (technical goods/Indian goods) are rough diamonds valued at approximately US$5-$50/ct. [2] Gems are rough diamonds with a value greater than US$50/ct.
Note: The categories "major, intermediate and minor" are defined by a combination of quantity (ct) and value of rough diamonds cut.

TABLE 5. RETAIL SALES OF DIAMOND JEWELLERY, 1984-93

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993[p]
					(US$ millions)					
United States	8 400	9 577	10 407	11 773	11 877	12 194	11 397	11 101	11 274	12 019
Japan	4 850	4 765	7 506	9 682	12 647	12 467	12 358	13 308	12 713	13 459
Europe	2 852	2 911	4 270	5 599	6 834	7 408	8 447	7 932	8 289	7 116
East Asia	558	556	985	1 281	1 685	1 878	1 892	2 160	2 481	2 719
Other	3 842	4 299	5 070	5 824	6 097	6 960	7 160	7 353	7 248	7 201
Total world	20 500	22 109	28 247	34 260	39 541	40 905	41 361	41 852	42 605	42 514

Source: De Beers Consumers Advertising Division Research, unadjusted for inflation.
[p] Preliminary.

TABLE 6. PRICES OF COLOURLESS DIAMONDS VS. FANCY COLOUR DIAMONDS

Colourless Diamonds				Price	Fancy Colour Diamonds				Price
Carats	Shape	Colour	Clarity	Per Carat	Carats	Shape	Colour	Clarity	Per Carat
				(US$)					(US$)
(C) 5.05	Rectangular	G	IF	13 600	(C) 4.72	Rectangular	Pink	VS1	140 400
(C) 23.25	Pear-shaped	F	IF	33 700	(S) 20.17	Emerald	Blue	VS2	490 952
(S) 11.00	Pear-shaped	D	IF	35 227	(C) 10.64	Circular (round)	Yellow	VS	7 250
(C) 4.13	Pear-shaped	E	IF	18 500	(S) 3.09	Emerald	Blue	VS1	132 524
(C) 30.75	Rectangular	D	IF	79 000	(S) 28.59	Oval	Yellow	VVS1	12 399
(C) 14.13	Rectangular	D	VVS1	32 900	(C) 12.02	Modified rectangular	Light yellow	IF	10 275
(C) 5.46	Rectangular	F	VVS2	15 600	(C) 5.94	Square	Intense yellow	VS1	41 200

Source: The Diamond Registry Bulletin, October 31, 1994, p. 5.
Notes: Sales results from both Sotheby's and Christie's major fall jewellery auctions show that fancy-coloured diamonds commanded substantially higher prices per carat – sometimes more than ten times the price fetched by stones of superior clarity including internally flawless stones or potentially internally flawless stones (if a small impurity can be removed through cutting). A notable exception: light yellow diamonds clearly command a lower price than pinks or blues. Auction houses are represented by (S) for Sotheby's or (C) for Christie's.

TABLE 7. SYNTHETIC DIAMONDS, WORLD PRODUCTION[1,2] BY COUNTRY, 1990-94

Country	1990	1991	1992	1993	1994[e]
			(000 carats)		
Belarus[e]	x	x	30 000	30 000	25 000
China[e]	15 000	15 000	15 000	15 500	15 500
Czech Republic	x	x	x	5 000[e]	5 000
Czechoslovakia[e,3]	10 000	10 000	10 000	x	x
France[e]	5 000	4 000	3 500	3 500	3 500
Germany	x	x	x	x	x
Greece[e]	1 000	1 000	750	1 000	1 100
Ireland[e]	60 000	60 000	60 000	66 000	65 000
Japan[e]	25 000	30 000	30 000	32 000	32 000
Romania[e]	3 000	3 000	5 000[r]	5 000[r]	5 000
Russia[e]	x	x	80 000	80 000	80 000
Serbia and Montenegro	x	x	5 000	5 000	5 000
Slovakia	x	x	x	5 000	5 000
South Africa, Republic of[e]	60 000	60 000	60 000	60 000[r]	60 000
Sweden[e]	25 000	25 000	25 000	25 000	25 000
U.S.S.R.[e,4]	120 000	120 000	x	x	x
Ukraine[e]	x	x	10 000	10 000	8 000
United States	x	90 000	90 000	103 000	104 000
Yugoslavia[e,5]	5 000	5 000	x	x	x
Total	329 000[r]	423 000	424 000[r]	446 000[r]	439 000

Source: U.S. Bureau of Mines.
[e] Estimated; [r] Revised; x Withheld to avod disclosing company proprietary data.
[1] Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; numbers may not add to totals shown. [2] Table includes data available through May 30, 1995.
[3] Dissolved December 31, 1992. [4] Dissolved December 1991. [5] Dissolved April 1992.