

DIAMOND



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DIAMOND

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GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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9 Diamond

Diamond has been the most valuable among gems for more than 2,000 years. Diamond occurs in two types of deposits, primarily in igneous rocks of basic or ultrabasic composition and in alluvial deposits derived from the primary sources. Its composition is pure carbon and has cubic crystal system and common form octahedron. India is known for its diamond cutting & polishing business especially for small sized diamonds. Most of the world's diamond cutting and polishing business comes to India, particularly to Surat in Gujarat. India depends largely on imports of rough gem diamonds for its Cutting and Polishing Industry as there is no notable production except for two producers in Madhya Pradesh whose limited production is too sparse to meet the Cutting and Polishing Industry's requirements. The cut and polished diamonds are predominantly re-exported.

Diamond has a high refractive index and strong dispersion which gives it exciting brilliance when cut as a faceted stone. Gem diamonds are transparent and colourless or show faint shades of different colours.

Flawless stones of good colour are abundantly used in gem trade while off-colour, flawed & defective stones, chips & cuttings as well as small grains & dust are used in many other ways in the industry. Industrial grade diamond, i.e., diamond that does not meet gem quality standards in terms of colour, clarity, size or shape and those that are produced as a by-product of mining gem diamonds continue to be used principally as abrasives in many applications despite their initial cost. Although diamond is more expensive than other abrasive materials, it is more cost-effective in numerous industrial processes because it lasts longer than any other material.

Broadly, industrial diamonds have three varieties viz, 'ballas' which is mass of minute diamond crystals difficult to cleave; 'bort' is yellowish grey to black

colour and massive, flawed or irregular in shape and 'carbonado' is black, very hard, opaque and without cleavage.

RESERVES/RESOURCES

Diamond occurrences are reported since prehistoric times in the country. Presently, diamond fields of India are grouped into four regions:

1. South Indian tract of Andhra Pradesh, comprising parts of Anantapur, Kadapa, Guntur, Krishna, Mahabubnagar and Kurnool districts;
2. Central Indian tract of Madhya Pradesh, comprising Panna belt;
3. Behradin–Kodawali area in Raipur district and Tokapal, Dugapal, etc. areas in Bastar district of Chhattisgarh; and
4. Eastern Indian tract mostly of Odisha, lying between Mahanadi and Godavari valleys.

As per the NMI data, based on UNFC system as on 1.4.2020, all India reserves/resources of diamond have been placed at 31.72 million carats. Out of these, 0.84 million carats are placed under Reserves category and 30.87 million carats under Remaining Resources category. By grades, about 3.32% resources are of Gem variety, 3.45% of Industrial variety and bulk of the resources (93.23%) are placed under Unclassified category. By States, Madhya Pradesh accounts for about 90.14% resources followed by Andhra Pradesh 5.74% and Chhattisgarh 4.12% (Table-1).

EXPLORATION & DEVELOPMENT

The Exploration & Development details, if any, are covered in the Review on Exploration & Development under "General Reviews".

**Table –1 : Reserves/Resources of Diamond as on 1.4.2020
(By Grades/States)**

(In carats)

State/Grades	Reserves				Remaining Resources						Total Resources (A+B)
	Proved STD111	Probable STD121	Total (A)	Feasibility STD211	Pre-feasibility STD221	Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
All India: Total	847400	0	847559	0	0	304601	1524317	29047514	0	30876432	31723991
By Grades											
Gem	297692	0	297692	0	0	158819	1017	596929	0	756765	1054457
Industrial	254559	0	254559	0	0	41664	223	798936	0	840823	1095382
Unclassified	295149	0	295308	0	0	104118	1523077	27651649	0	29278844	29574152
By States											
Andhra Pradesh	0	0	0	0	0	200483	1524317	98155	0	1822955	1822955
Chhattisgarh	0	0	0	0	0	0	0	1304000	0	1304000	1304000
Madhya Pradesh	847400	0	847559	0	0	104118	0	27645359	0	27749477	28597036

Figures rounded off

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PRODUCTION & STOCKS

Production of diamond was at 266 carats in 2021-22 as against 13,917 carats in the previous year. There were three reporting mines, both under Public Sector located in district Panna of Madhya Pradesh (Tables- 2 & 3).

Out of the total output, Gem variety covering

rough & uncut constituted 67% and the remaining 33% was of Industrial grade and other varieties (Table-4).

Mine-head closing stocks during the year 2021-22 were 78 carats as against 25,329 carats in the previous year (Table-5).

The average daily employment of labour during 2021-22 was 677 as against 142 in 2020-21.

Table – 2 : Principal Producers of Diamond, 2021-22

Name and address of producer	Location of mine	
	State	District
Directorate of Geology & Mining (Diamond Project), Government of Madhya Pradesh, Khanij Bhavan, 29-A, Arera Hills, Bhopal - 462 016, Madhya Pradesh.	Madhya Pradesh	Panna

**Table – 3 : Production of Diamond, 2019-20 to 2021-22
(By State)**

(Quantity in carats; Value in ₹'000)

State	2019-20		2020-21		2021-22 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	28816	352472	13917	147696	266	18051
Madhya Pradesh	28816	352472	13917	147696	266	18051

**Table – 4 : Production of Diamond, 2020-21 & 2021-22
(By Sector/State/District/Grades)**

(Quantity in carats; Value in ₹'000)

State/District	No. of mines	2020-21					2021-22 (P)					
		Quantity				Value	Quantity				Value	
		Gem (rough & uncut)	Industrial*	other	Total		Gem (rough & uncut)	Industrial*	other	Total		
India	2	5014	4580	4323	13917	147696	3	179	42	45	266	18051
Public Sector	2	5014	4580	4323	13917	147696	3	179	42	45	266	18051
Madhya Pradesh	2	5014	4580	4323	13917	147696	3	179	42	45	266	18051
Panna	2	5014	4580	4323	13917	147696	3	179	42	45	266	18051

* Includes off-colour and dark-brown varieties of diamond.

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**Table – 5 : Mine-head Closing Stocks of Diamond, 2020-21 & 2021-22
(By State)**

State	2020-21	2021-22 (P)
India	25329	78
Madhya Pradesh	25329	78

(In carats)

MINING & PROCESSING

Majhgawan in Madhya Pradesh is a fully mechanised mine operated by National Mineral Development Corporation Ltd. It is worked by opencast method in tuff rock by deploying 4.1 cu. m hydraulic shovel and 40 tonnes dumpers in combination. The mine benches have been designed with a height of about 10 m. A few benches were of 4-5 m in height. Drilling is done by 4-inch diameter drills and charged with slurry explosives, and about 40–50 holes are blasted at a time with delay pattern. The capacity of the mine is about 30,000 carats per year. Diamonds are also recovered from conglomerate and gravel beds at shallow depths by small operations on the basis of annual permits granted by Diamond Officer, Government of Madhya Pradesh. At Majhgawan, kimberlite rock, after mining the ore is stockpiled for weathering action and then is fed to crushing plant. It is processed through Heavy Media Separation System in processing plant for recovery of diamond. Recently, X-ray diamond sorter has been installed for sorting of diamonds from ore and this has increased the recovery of raw diamonds to 98%.

Diamond Mining Factors

Grade

Grade is the weight of diamond expressed as carats per tonne (ct/t) of ore. It varies widely from one mine to another but generally falls somewhere between 0.3 and 1.3 ct/t. One carat is equivalent to 0.2 grams.

Size (weight) of Rough Diamonds in Deposit

Individually, rough diamonds can range from microweight to stones weighing more than 1,000 carats. Depending on the mine, the average size of rough diamond recovered can weigh from 0.01 ct (about 1 mm) to more than 0.7 ct. Many mines in the world show an average of about 0.4 to 0.5 ct per tonne.

INDUSTRY

Indian Diamond Industry enjoys credible standing and reputation in the world market, particularly for small diamonds used in jewellery. Indian diamond manufacturing standards are reckoned as the best in the world. Workmanship & skill of Indian artisans at polishing small diamonds economically and efficiently has been widely acknowledged. Surat in Gujarat is the main centre of the Cutting and Polishing Industry.

The Indian Diamond Industry thrives in the atmosphere of secrecy and informality that envelops the diamond trade and has for long been labeled as an unorganised sector of the economy. However, it resembles a close-knit community composed of thousands of small, medium and large sized CPD (cut and polished diamonds) units and has grown to become one of the highest foreign exchange earners for the country. An in-depth study of the Industry reveals that the so called unorganised sector is in fact highly organised and has great potential to offer useful insights to the field of management in terms of new forms of organising, networking, business processing and conducting international business.

India's predominance as leader in the world market is due to a combination of pragmatic policies of the Government and sustained efforts of exporters. Policy changes, such as, creation of Special Economic Zones (SEZ) is expected to boost the export prospects further. Several diamond polishing companies have already established offices in India for trading in rough & polished diamonds. India obtains rough diamonds from Belgium, UK, Hong Kong, UAE, Israel, etc. Indian diamond traders seek opportunities to establish direct trade ties with mining companies. The expectations of the Indian Diamond Industry are to access rough diamonds at competitive rates directly from the producers to maintain its lead in the world market.

Tripartite MoU among Government of Madhya Pradesh (MRD, through DGM), MPSMCL & NMDC

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was signed for geological and geophysical exploration in various Districts of Madhya Pradesh. In this regard, Government of Madhya Pradesh issued Gazette Notifications of 20 diamond prospective blocks which are applied under MoU for exploration and subsequent reservation.

Remote Sensing Studies have been completed in collaboration with NRSC. Chhattarpur-Panna Block 1, Chhattarpur-Panna Block 2 and Damoh Block, Panna (5 Prospective Blocks) and Additional 12 Diamond Blocks.

Several target areas were established after conducting ground magnetic, VLF-EM & Gravity surveys and stream sediment sampling and several additional anomalous areas were demarcated in the diamond blocks by processing the Raw Aeromagnetic Data acquired/provided by GSI in Diamond Blocks.

Forest applications for drilling has been prepared and submitted. The matter is being pursued with Forest Department for obtaining permission for drilling.

Proposals were submitted by NMDC to the Government of Chhattisgarh for Baloda–Belmundi Diamond Block over an area of 156.80 sq km in Saraipali tehsil, Mahasamund district for reservation under Section 17(A) (2A) of MM (D&R) Amendment Act, 2015 for undertaking prospecting and exploitation operations. Ministry of Mines, Government of India vide G.S.R.744(E) dt 14.10.2021 granted reservation of Baloda–Belmundi Diamond Block for PL or ML in favour of NMDC-CMDC limited under Section 17A(1A) of MMDR Act, 1957. NCL vide letter dated 13.01.2022, submitted application to Secretary, MRD, Government of Chhattisgarh for grant of Prospecting Licence for Baloda–Belmundi Diamond Block.

CONSUMPTION

Industrial diamonds are mostly consumed by manufacturers of drill bits, grinding tools and stone cutting & polishing machines and demand of industrial diamonds is mostly met by imports. There are many small-scale sector units that operate in cutting & polishing trade.

SUBSTITUTES

Synthetic Diamond

Today, market for industrial diamond is dominated by synthetic stones, first developed in 1950s. Synthetic

diamonds manufactured using high pressure and high temperature methods compete as an abrasive mineral with natural industrial diamonds and also with manufactured materials like silicon carbide (SiC), alumina (Al₂O₃), tungsten carbide (WC) and carbide boron nitrate (CBN). Synthetic diamonds being marketed are mostly 0.6 to 0.8 mm and smaller in size. Synthetic Diamond Abrasives (SDA) are used for sawing, drilling or milling hard stones, concrete aggregate, refractory materials, masonry and asphalt. In general, large crystals are used for cutting softer materials and smaller crystals for tougher jobs. Synthetic diamonds now account for bulk supply of industrial diamonds and are preferred over natural diamonds because their quality can be controlled to suit customer's requirements.

Synthetic diamonds were produced earlier by using graphite with a metal catalyst under very high pressure & temperature.

Of late a new process, such as, Chemical Vapour Deposition (CVD) has been evolved which requires relatively low pressure for production of synthetic diamonds. This process involves depositing tiny crystals of diamond on a film which can be built in complicated shapes and used at desired places or instruments, such as, machine part, heat conductors in micro circuit, shortwave UV, microwave sources and radiation detectors. In future, CVD can be a substitute for silicon in Computer Industry. In USA, developments have taken place in CVD method of growing 100% pure diamond using microwave plasma technology. This method is more economical and also enables production of larger crystals.

TRADE POLICY

Import of diamond under HS Code 7102, Diamonds, whether or not worked, but not mounted or set, fall under 'Free' category as per the Import Policy ITC(HS), 2022 Schedule 1. Foreign Direct Investment (FDI) in diamond mining up to 100% is admissible for automatic approval of Reserve Bank of India.

WORLD REVIEW

The world reserves of industrial diamond are about 1,300 million carats located mainly in Russia (46%), Botswana (23%), Congo (Kinshasa) (12%), South Africa (9%) and Australia (1%). The world reserves of diamond are furnished in Table-6.

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The total world production of diamond increased by about 6% from 111.75 million carats in 2020 to 118.03 million carats in 2021.

The principal producers were Russia (33%), Botswana (19%), Canada (15%), Dem. Rep. of Congo (11%), South Africa (8%) and Angola (7%). During the year, increase in diamond production was observed in Russia, Botswana, Canada while decrease in production was observed in Dem. Rep. of Congo (Table-7).

Natural diamonds are cut in about 52 countries. The major diamond cutting centres in the world are Antwerp in Belgium, Ramat Gan in Israel, New York in USA, Surat in India and Guangzhou & Shenzhen in China.

**Table – 6 : World Reserves of Diamond
(Industrial)
(By Principal Countries)**

Country	Reserves (In million carats)
World : Total (rounded off)	1300
Australia	11 ^a
Botswana	300
Congo (Kinshasa)	150
Russia	600
South Africa	120
USA	NA
Zimbabwe	NA
Other countries	120

Source: Mineral Commodity Summaries, USGS, 2023 a - In Australia, Joint Ore Reserves Committee - compliant reserves were 10 million carats.

**Table – 7 : World Production of Diamond
(By Principal Countries)**

Country	(In carats)		
	2019	2020	2021
World: Total	141649276	111746869	118032675
Russia	45271212	31186551	39116970
Botswana	23687000	16868000	22696000
Canada	18491388	15035711	17353418
Congo, Dem. Rep.	18892000	16560000	12773000
South Africa	7177435	8470840	9723811
Angola	9149746	7734281	8723069
Zimbabwe	2119189	2670458	4224300
Namibia	1745281	1484290	1517525
Sierra Leone	824430	686020	829330
Other countries	14291595	11050718	1075252

*Source: BGS World Mineral Production, 2017-2021
Figures rounded off*

For a generalised view of the development in various countries, the countrywise description sourced from the latest available publication of Minerals Yearbook 'USGS 2018' is furnished below.

Lesotho

The Liphobong Diamond Mine in the Maluti Mountains of northern Lesotho began ramping up production in late 2016 and had its first full year of commercial production in 2018, when reported production was 8,36,000 carats. The mine was owned by Firestone Diamonds plc (75%) and the Government of Lesotho (25%).

Russia

ALROSA officially commissioned and started mining at the Verkhne-Munskoe Diamond Field in Yakutia on October 31, 2018. Four kimberlite pipes were explored during the last quarter of 2018. ALROSA estimated that the deposit would yield 1.8 million carats of rough diamonds per year, and the estimated reserves of the Verkhne-Munskoe diamond field were sufficient to operate for more than 20 years.

South Africa

De Beers Consolidated Mines Pty. Ltd. safely closed the mine in December 2018, but the South African Department of Mineral Resources continued looking for an operator capable of purchasing the mine. De Beers also operated the Venetia Mine in Limpopo Province, where it was conducting a \$2 billion project to take the mine underground and extend its operating life into the 2040.

Exports

Value of exports of diamond increased by 51% to ₹18,93,641 crore in 2021-22 against ₹12,58,209 crore in the previous year. Diamond (mostly cut) alone accounted for almost cent per cent exports in terms of value during this year. The share of industrial diamonds and diamond powder was about ₹116 crore and ₹29 crore, respectively in 2021-22. Exports were mainly to USA (39%), Hong Kong (25%), Belgium (10%), UAE (8%), Israel (6%) and Thailand (4%) (Tables- 8 to 11).

Imports

In 2021-22, imports value of diamond increased by about 60% to ₹2,05,638 crore from ₹1,28,351 crore in the previous year. Diamond (mostly cut) shared the bulk, i.e., almost cent per cent of the imports in terms of value. Imports of industrial diamond and diamond powder were about 16.46 million carats and 1,238 million carats, respectively, valued at ₹1,078 crore and ₹286 crore, respectively. Imports were mainly from UAE (35%), Belgium (21%), USA (20%), Hong Kong (6%), Israel (5%) and South Africa (3%) (Tables-12 to 15).

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**Table – 8 : Exports of Diamond : Total
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty **	Value (₹'000)	Qty **	Value (₹'000)
All Countries	**	1258209200	**	1893641728
USA	**	457334506	**	730165646
Hong Kong	**	428968079	**	480271367
Belgium	**	93205300	**	195508832
UAE	**	82269885	**	147555721
Israel	**	60576761	**	106610481
Thailand	**	43003607	**	79414507
Japan	**	20619224	**	22221449
Botswana	**	9885172	**	17209611
UK	**	7183160	**	14740939
South Africa	**	3172877	**	14582002
Other countries	**	51990629	**	85361173

Figures rounded off

Note:***Not additive

**Table – 10 : Exports of Diamond (Mostly Cut)#
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty **	Value (₹'000)	Qty **	Value (₹'000)
All Countries	**	1257345848	**	1892188684
USA	**	457215875	**	730021717
Hong Kong	**	428965865	**	480235350
Belgium	**	93050333	**	195229955
UAE	**	82023002	**	147191583
Israel	**	60500703	**	106470422
Thailand	**	43003607	**	79413563
Japan	**	20616732	**	22221449
Botswana	**	9880102	**	17205542
UK	**	7139914	**	14670617
South Africa	**	3172521	**	14581953
Other countries	**	51777194	**	84946533

Figures rounded off

Note:***Not additive

**Table – 9 : Exports of Diamond
(Industrial)
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (carats)	Value (₹'000)	Qty (carats)	Value (₹'000)
All Countries	7015880	688082	12125962	1162179
UAE	888985	246629	2404968	364101
China	625042	119753	744326	251477
Belgium	910757	131789	1757240	239666
Israel	2360952	50514	2758537	94752
USA	532191	57876	676370	69773
Ireland	794330	22380	1439993	37284
U K	812206	21261	1827954	37222
Taiwan	1067	23159	1354	27753
Germany	4777	4377	25017	15626
Russia	50000	874	446000	8164
Other countries	35573	9470	44203	16361

Figures rounded off

**Table – 11 : Exports of Diamond (Powder)
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (TCA)	Value (₹'000)	Qty (TCA)	Value (₹'000)
All Countries	10628	175270	13991	290865
USA	4002	60755	3993	74156
Israel	1710	25544	2538	45307
Belgium	716	23178	1471	39211
UK	894	21985	1412	33100
Germany	781	24045	1291	30079
Hong Kong	++	12	3	29420
China	1327	5966	1475	22688
Ireland	231	7428	413	10148
Switzerland	707	1844	1138	3865
Botswana	60	429	53	722
Other countries	200	4084	204	2169

Figures rounded off

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**Table – 12 : Imports of Diamond
(By Countries)**

Country	2020-21(R)		2021-22 (P)	
	Qty	Value (₹'000)	Qty	Value (₹'000)
All Countries	**	1283511854	**	2056382187
UAE	**	367595066	**	712821699
Belgium	**	256742721	**	428174842
USA	**	263507101	**	420102490
Hong Kong	**	171122660	**	133013019
Israel	**	46243763	**	96946989
South Africa	**	46613537	**	70089263
Russia	**	50361552	**	60104585
Thailand	**	18361551	**	41225238
Botswana	**	32833354	**	38419662
UK	**	1896882	**	12794236
Other countries	**	28233667	**	42690164

Figures rounded off.

*Note:***Not additive*

**Table – 13 : Imports of Diamond
(Industrial)
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (carats)	Value (₹'000)	Qty (carats)	Value (₹'000)
All Countries	8725537	4362112	16457278	10785779
UAE	6759538	3532523	8105132	6012974
Belgium	752966	301629	4953064	2590443
Russia	423311	343374	1976284	1646523
Hong Kong	78669	63307	397600	252238
Israel	499907	35363	873319	229252
South Africa	187761	81527	103300	30425
UK	9471	1023	36970	17832
Botswana	-	-	4874	2626
Italy	-	-	2635	2375
Ireland	3150	562	4100	1091
Other countries	10764	2804	-	-

Figures rounded off

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**Table – 14 : Imports of Diamond (Powder)
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (TCA)	Value (₹'000)	Qty (TCA)	Value (₹'000)
All Countries	839962	1898403	1238216	2866544
China	809594	1645875	1199714	2484163
Ireland	11283	95603	19276	156390
Hong Kong	9914	57581	5234	64074
U S A	3286	40671	5296	63898
Korea, Rep. of	1406	10624	2907	29124
Switzerland	929	17559	1363	26463
Belgium	1660	19964	1934	26299
UK	80	1890	989	5942
UAE	-	-	650	3526
Germany	116	560	585	2819
Other countries	1694	8076	268	3846

Figures rounded off

**Table – 15 : Imports of Diamond (Mostly cut)
(By Countries)**

Country	2020-21(R)		2021-22 (P)	
	Qty **	Value (₹'000)	Qty **	Value (₹'000)
All Countries	**	1277251339	**	2042729864
UAE	**	364062543	**	706805199
Belgium	**	256421128	**	425558100
USA	**	263466281	**	420038592
Hong Kong	**	171001772	**	132696707
Israel	**	46208400	**	96717737
South Africa	**	46532010	**	70058838
Russia	**	50018178	**	58458062
Thailand	**	18360627	**	41225238
Botswana	**	32833354	**	38417036
UK	**	1893969	**	12770462
Other countries	**	26453077	**	39983893

Figures rounded off

Note:**'Not additive

FUTURE OUTLOOK

The Diamond Industry in the country currently employs over 8 lakh artisans who are experts in cutting and polishing of small diamonds and are now in a position to process full range of sizes and qualities of gemstones using latest technology.

The Chinese Government has begun to initiate multi-billion dollar deals for rough diamonds in exchange for things that China produces like medicines, oils and industrial goods & services. Also, China's investment in Africa is a large threat to the Indian Diamond Cutting and Polishing Industry. There is a growing preference for polishing diamonds in countries where the diamonds are mined, like in

Africa. It means that the Indian sector may face problems as India is not a large producer, and depends on import of rough diamonds from Africa. Low profit margins in the cutting and polishing segment have heightened midstream players' interest in synthetic diamonds, but synthetics have to be contented with only limited acceptance among jewellery retailers and end consumers.

With the support in the form of increasing urbanisation, middle-class expansion and appeal as engagement rings, India will emerge as a third largest market for diamond jewellery leaving behind Europe and Japan. Meanwhile, China and the US are expected to remain as the leading diamond jewellery markets.

