

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. Indian Diamond Industry handles about 80% of the global polished diamond market. India depends largely on imports of rough gem diamonds for its Cutting and Polishing Industry as there is no notable production except for one producer in Madhya Pradesh whose limited production is too sparse to meet the Cutting and Polishing Industry's requirements. The cut and polished diamonds are re-exported. The Indian Government's recent fiscal and monetary reforms (Demonetisation and Goods & Services Tax) have generally been welcomed by the diamond business community. Despite short-term disruption, reforms are seen as an instrument for creating a more stable and professional environment and an opportunity for improved economic growth. Larger retailers and companies in the midstream that have been able to maintain normal operations are seeing the benefits of transparency and compliance with more stringent financial regulations.

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 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 for gem diamonds continue to be used principally as abrasives in many applications despite their initial cost. Although diamond is more expensive than the 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 pre-historic 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 1.4.2015, all India reserves/resources of diamond have been placed at 31.83 million carats. Out of these, 0.95 million carats are placed under Reserves category and 30.87 million carats under Remaining Resources category. By grades, about 2.37% resources are of Gem variety, 2.64% of Industrial variety and bulk of the resources (95%) are placed under Unclassified category. By States, Madhya Pradesh accounts for about 90.18% resources followed by Andhra Pradesh 5.72% and Chhattisgarh 4.09% (Table-1).

EXPLORATION & DEVELOPMENT

The Exploration & Development details are given in the review on EXPLORATION & DEVELOPMENT in "GENERAL REVIEWS".

**Table -1: Reserves/Resources of Diamond as on 1.4.2015
(By Grades/States)**

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 Resources (A+B)
	STD121	STD122		STD221	STD222						
All India: Total	-	159	959659	-	-	304601	1524317	29047514	-	30876432	31836091
By Grades											
Gem	-	-	-	-	-	158819	1017	596929	-	756765	756765
Industrial	-	-	-	-	-	41664	223	798936	-	840823	840823
Unclassified	-	159	959659	-	-	104118	1523077	27651649	-	29278844	30238503
By States											
Andhra Pradesh	-	-	-	-	-	200483	1524317	98155	-	1822955	1822955
Chhattisgarh	-	-	-	-	-	-	-	1304000	-	1304000	1304000
Madhya Pradesh	-	159	959659	-	-	104118	-	27645359	-	27749477	28709136

Figures rounded off

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PRODUCTION & STOCKS

Production of diamond was at 36516 carats in 2016-17 as against 36,044 carats in the previous year. There were two operating mines, both under Public Sector located in Panna district of Madhya Pradesh. The one mine out of these two mines that is operated by NMDC Ltd contributed almost the entire production of diamond and a very small quantity of production was reported by the Department of Geology and Mining, Government of Madhya Pradesh (Tables 2 & 3).

Out of the total output, gem variety covering only rough & uncut constituted 37% and the remaining 63% was of industrial grade covering both off-colour and dark brown varieties (Table -4).

Mine-head closing stocks during the year 2016-17 were 24,102 carats as against 14,084 carats in the previous year (Table-5).

The average daily employment of labour during 2016-17 was 157 as against 156 in the previous year.

Table – 2: Principal Producers of Diamond, 2016-17

Name & address of producer	Location of Mine	
	State	District
National Mineral Development Corporation Ltd 10-3-311-/A, Khanij Bhavan, Castle Hills, Masab Tank, Hyderabad-500 028, Andhra Pradesh	Madhya Pradesh	Panna
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, 2014-15 to 2016-17
(By State)**

(Quantity in carats; value in ₹'000)

State	2014-15		2015-16		2016-17 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India /Madhya Pradesh	36107	613504	36044	621441	36516	639596

**Table – 4: Production of Diamond, 2015-16 & 2016-17
(By Sector/State/District/Grades)**

(Quantity in carats; value in ₹'000)

State/District	No. of mines	2015-16				2016-17 (P)				
		Quantity			Value	Quantity			Value	
		Gem (rough & uncut)	Industrial*	Total		Gem (rough & uncut)	Industrial*	Total		
India/Public Sector	2	12784	23260	36044	621441	2	13488	23028	36516	639596
Madhya Pradesh/ Panna	2	12784	23260	36044	621441	2	13488	23028	36516	639596

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

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**Table – 5: Mine-head Closing Stocks of Diamond, 2015-16 & 2016-17
(By State)**

(In carats)

State	2015-16	2016-17 (P)
India/Madhya Pradesh	14084	24102

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. Few benches are of 4-5 m 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 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.

As per the Southern Gujarat Chambers of Commerce there are about 3500 to 4500 diamond processing units in Surat employing about 1.5 million people. Most of them now use computerised cutting machines with deployment of the latest technology. India continues to be the dominant player in the world Diamond Cutting and Polishing Industry. According to India's Gem & Jewellery Export Promotion Council (GJEPC), India has further strengthened its world dominance.

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 countries and 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.

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 - 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 require 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, whether or not worked, but not mounted or set, fall under 'Free' category as per the Export-Import Policy 2015-2020. 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 1,200 million carats located mainly in Russia (54%), Congo (Kinshasa) (12.5%), Australia (10%) Botswana (7.5%) and South Africa (6%). The world reserves of diamond are furnished in Table-6.

The total world production of diamond increased by about 2% from 124 million carats in 2014 to 127 million carats in 2015.

The principal producers were Russia (33%), Botswana (16%), Congo, Dem. Rep. and Australia (11%) each, Canada (9%) , Angola (7%) and South Africa (6%). During the year, increase in diamond production was observed in Australia (46%), Russia (9%), Angola (3%) while the production in Botswana (16%), Canada (4%), Congo, Dem. Rep.(3%) reported declining trend (Table 7).

Natural diamonds are cut in 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) for the year 2017 (By Principal Countries)

(In million carats)	
Country	Reserves
World : Total (rounded)	1200
Australia	120
Botswana	90
Congo (Kinshasa)	150
Russia	650
South Africa	70
Other countries	90

Source: Mineral Commodity Summaries, 2018

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

Country	(In '000 carats)		
	2013	2014	2015
World: Total	129953	124469	126579
Angola	8599	8791	9016
Australia	11482	9288	13561
Botswana	22597	24658	20824
Canada	10562	12082	11600
Congo, Dem.Rep.of	16653	14689	14284
Ghana	159	241	174
Guinea	202	164	162
Lesotho	414	346	304
Namibia	1776	1898	1988
Russia	37884	38304	41912
Sierra Leone	605	594	500
South Africa	8168	8060	8233
Zimbabwe	10412	4772	3491
Other countries	441	581	529

Source: World Mineral Production, 2011-2015.

Canada

The Gahcho Kué Mine in the Northwest Territories, Canada, began commercial production in February 2017. The mine is expected to be one of the world's largest diamond mines and it is estimated that the mine will produce around 54 million carats of rough diamond over its 12-year lifetime.

Rio Tinto and Dominion Diamond Corporation's Diavik Mine A 21 Extension will start production in 2018.

Botswana

The Cut - 8 project at Jwaneng Mine in Botswana owned by De Beers will begin producing diamonds in 2017.

Russia

ALROSA's Verkhne-Munskoe Mine is due for completion in 2018. It is the only greenfield project expected to be commissioned in the medium term. Several brownfield projects are underway.

Angola

ALROSA announced in 2017 that it has plans to work with Endiama to develop the Luele kimberlite mine in the Luaxe concession in Angola.

FOREIGN TRADE

Exports

Value of exports of diamond was at ₹ 1,62,677 crore during 2016-17. Exports were mainly to Hong Kong

(38%), USA (30%), Belgium (10%) and UAE (9%). Value of exports of diamond decreased by about 4% to ₹ 1,42,734 crore in 2015-16 against ₹ 1,48,102 crore in the previous year. Diamond (mostly cut) alone accounted for almost cent-percent exports in terms of value. The share of industrial diamonds and diamond powder was about ₹ 34 crore and ₹ 36 crore, respectively in 2015-16. Exports were mainly to Hong Kong (36%), USA (30%), Belgium and UAE (10%) each and Israel about (5%) (Tables- 8 to 12).

Imports

Import value of diamond was at ₹ 1,29,522 crore during the year 2016-17. Imports were mainly from Belgium (26%), UAE (23%), Russia (12%), Hong Kong (11%), Botswana (7%) and Israel (6%). In 2015-16 imports value of diamond decreased by about 12% to ₹ 1,10,565 crore from ₹ 1,25,214 crore in the previous year. Uncut diamond shared the bulk, i.e., almost cent-percent of the imports. Imports of industrial diamond and diamond powder were about 0.53 million carats and 287 million carats respectively valued at ₹ 50 crore and ₹ 137.11 crore respectively. Imports were mainly from Belgium (39%), UAE (22%), Hong Kong (11%), Russia (7%), Israel (6%) and Saudi Arabia (3%). (Tables-13 to 17).

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

Country	(₹'000)
	2016-17 (P)
All Countries	1626772519
Hong Kong	615307461
USA	494268760
Belgium	160121091
UAE	147895713
Israel	66485466
Thailand	35650539
Singapore	19935868
Japan	16072023
Switzerland	11575597
Australia	10473674
Other countries	48986327

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

Country	2014-15	2015-16 (P)
	Value (₹'000)	Value (₹'000)
All Countries	1481021701	1427340191
Hong Kong	562796247	515660381
USA	393506812	426775000
Belgium	160742386	145177411
UAE	155041337	143162330
Israel	71911495	65219100
Thailand	37262011	36570823
Singapore	9881402	14566160
Japan	15594603	14200147
Switzerland	13135361	13119569
Australia	10066613	10620220
Other countries	51083434	42269050

Note : Quantity not given due to partial coverage; value figures, however, have full coverage.

**Table – 10: Exports of Diamond
(Industrial)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (carats)	Value (₹'000)	Qty (carats)	Value (₹'000)
All Countries	4351127	168693	5651009	342213
UK	813817	27041	1754200	68184
Belgium	498302	40761	1271305	63124
UAE	-	-	200528	59560
Israel	1659447	26744	1199300	51839
Ireland	139410	9124	436046	31220
USA	910824	45844	425225	30926
China	62905	5342	211650	18141
Hong Kong	64500	4597	78142	11869
Chinese				
Taipei/Taiwan	140	753	3025	3367
Germany	101300	3620	56700	2909
Other countries	100482	4867	14888	1074

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

Country	2014-15		2015-16 (P)	
	Qty (carats)	Value (₹'000)	Qty (carats)	Value (₹'000)
All Countries	74999043	1480557682	60737949	1426640488
Hong Kong	15304209	562757037	12983767	515643397
USA	7582016	393373221	10602356	426641928
Belgium	12721672	160674217	10082880	145021344
UAE	29295199	155031605	18100065	143056634
Israel	1596657	71860524	1310706	65134122
Thailand	1501877	37261962	1477504	36570653
Singapore	402466	9880970	615979	14565988
Japan	1036810	15585010	826695	14186480
Switzerland	265389	13128862	236566	13111622
Australia	123611	10066613	107112	10620220
Other countries	5169137	50937661	4394319	42088100

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**Table – 12: Exports of Diamond (Powder)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (‘000 carats)	Value (₹‘000)	Qty (‘000 carats)	Value (₹‘000)
All Countries	18705	295326	9702	357490
USA	3384	87747	2721	102146
Belgium	753	27408	875	92943
UAE	225	9732	148	46136
Israel	967	24227	1461	33139
Germany	522	20766	710	22700
Ireland	588	23252	893	16272
Japan	59	8922	29	12761
UK	909	38776	286	10500
Switzerland	181	6499	132	7947
Hong Kong	10356	34613	308	5115
Other countries	761	13384	2157	7831

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

Country	2014-15	2015-16 (P)
	Value (₹‘000)	Value (₹‘000)
All Countries	1252140913	1105651211
Belgium	547601092	426029350
UAE	246220048	244340863
Hong Kong	135536847	126934094
Russia	46935304	72046802
Israel	66438542	68585039
Saudi Arabia	37070845	33259930
Botswana	55940629	32860354
USA	36328269	31816285
Canada	18349497	25544469
South Africa	6424596	12604242
Other countries	55295244	31629783

Note: Quantity not given due to partial coverage; value figures, however, have full coverage.

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

Country	2016-17 (P)
	(₹‘000)
All Countries	1295224287
Belgium	340295786
UAE	297943715
Russia	151284883
Hong Kong	140719960
Botswana	87586948
Israel	74632598
Canada	36923798
South Africa	31298637
USA	27109771
Saudi Arab	25247548
Angola	20838717
Singapore	18024869
Other countries	43317057

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

Country	2014-15		2015-16 (P)	
	Qty (carats)	Value (₹‘000)	Qty (carats)	Value (₹‘000)
All Countries	520983	298568	527650	495371
Russia	334276	125124	333324	263655
Congo, P. Rep.of	40749	27561	85823	111164
UAE	-	-	44038	67266
Netherlands	-	-	25104	23515
Belgium	32507	38783	24947	21493
UK	2242	3129	1690	3729
South Africa	20441	11498	11755	2663
Congo, Dem. Rep.of	28339	27611	242	657
USA	13146	14486	55	548
Australia	-	-	354	332
Other countries	49283	50376	318	349

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**Table – 16: Imports of Diamond (Powder)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (‘000 carats)	Value (₹’000)	Qty (‘000 carats)	Value (₹’000)
All Countries	351378	1494388	287431	1371128
China	313840	1151011	262914	1120520
Ireland	5405	72024	6418	85501
USA	5933	60129	5402	58329
Korea, Rep. of	2698	35328	3833	41133
Belgium	2207	39669	1530	22601
Switzerland	725	16244	815	14242
Hong Kong	19432	43704	4593	12946
Netherlands	45	844	488	4164
Russia	1	1396	229	3751
UAE	462	7633	248	2123
Other countries	630	66406	961	5818

**Table – 17: Imports of Diamond (Mostly Uncut)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (carats)	Value (₹’000)	Qty (carats)	Value (₹’000)
All Countries	150487349	1250347957	151535456	1103784712
Belgium	72213876	547522640	63359688	425985256
UAE	34460027	246212415	41592023	244271474
Hong Kong	10301636	135493143	9106084	126921148
Russia	7727040	46808784	14221029	71779396
Israel	4566305	66437968	3149337	68584617
Saudi Arabia	2680462	37070845	2122952	33259930
Botswana	5626424	55927638	2591664	32860354
USA	4806933	36253654	3556020	31757408
Canada	2693723	18349497	5278462	25544469
South Africa	864572	6413098	811507	12601579
Other countries	4546351	53858275	5746690	30219081

FUTURE OUTLOOK

In the Union Budget 2017-18, the Government of India, offered tax cuts for the middle class and other sections of society (5 per cent for the Rs 250,000-500,000 tax slab; which was 10 per cent initially). All these measures will drive consumption, which will be favorable to the gems and jewellery industry.

The Government of India's proposal to cut corporate tax rates to 25 per cent for micro, small and medium enterprises (MSMEs) having annual turnover up to ₹ 50 crore will benefit a large number of gems and jewellery exporters from MSME category.

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 and 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 will have to face problems at home because India is not a large producer, and therefore, has to import 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 contented with only limited acceptance among jewelry retailers and end consumers.

With the support in the form of increasing urbanization, middle-class expansion and appeal as engagement rings, India is set to emerge as the third-largest market for diamond jewelry by 2020, leaving behind Europe and Japan. Meanwhile, China and the US are expected to remain as the leading diamond jewelry markets.