

KIRTANE & PANDIT



THE
RISE
OF
LAB
GROWN
DIAMONDS
IN INDIA

Market Evolution and Future Trajectories

April 2026

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1. EXECUTIVE SUMMARY



India's diamonds story is decidedly entering a new phase. The global diamonds market has shifted significantly over the past decade, driven by advances in lab-grown diamond (LGD) manufacturing technology, cost-efficient production, and changing demand. As lab-grown diamonds gain momentum as a scalable, transparent, and commercially viable alternative to natural mined diamonds, India is positioning itself as the global centre, both for cutting and polishing (over 90% of diamonds sold in the world are cut and polished in Surat), as well as for lab-grown diamond production (India has a 35-40% share in global production and ranks second in the world behind China).

The past decade saw growing acceptance of gem-grade LGDs among retailers, consumers, and regulators (in the US market, consumer awareness of lab-grown diamonds rose from approximately 9-10% in 2010 to around 84% by 2025). Leading jewellery brands like Pandora, Swarovski, Giva, and Tanishq have announced collections with lab-grown diamonds. Many manufacturers are also shifting to 100% renewable energy for diamond manufacturing, resulting in a much lower carbon footprint than comparable mined diamonds. Additionally, while jewellery remains the most popular use, diamonds also have extensive, little-known, and fascinating applications in the fields of defence, construction, medicine, quantum computing, and high-power, high-voltage electronics, such as electric vehicles, satellites, and 5G networks. Custom-made lab-grown diamonds are also emerging as the next best option for semiconducting, an alternative to silicon-based chips, which consume more power.

In the past few years, the global diamond market has been at an inflection point, with falling prices, weaker demand, and geopolitical factors affecting the economy, leading to rising inventory levels across the natural and lab-grown diamond industries, and an eventual price correction. Specifically, lab-grown diamonds experienced sharp price declines - a lab-grown diamond is now 70-90% cheaper than a comparable natural diamond, according to analyst Paul Zimnisky. A 1-carat, high-quality lab diamond costs between USD 800 and 1,000 as compared to a 1-carat natural diamond which costs around USD 4,000. The reason for the rapid decline in prices of lab-grown diamonds is that the cost to produce a diamond is relatively low using the CVD method (and expected to fall further) and because the supply chain is shorter than that for natural diamonds.

Despite price pressures, the global lab-grown diamond industry is expected to continue expanding. Industry estimates indicate that lab-grown diamond prices are approaching production cost floors, and unless there are major technological breakthroughs, the market may be close to reaching a price equilibrium, i.e. a price stabilisation at lower levels. A likely outcome for the diamond market is one in which lab-grown diamonds position themselves primarily as a technology-driven, accessible alternative to natural diamonds rather than a scarcity-based luxury product, leading to two distinct segments with divergent prices that coexist and cater to separate end-use applications.



Focusing on India's growth opportunities in this sector, it is important to note that the volume of India's exports of lab-grown diamonds has almost doubled over the past 2 years, even as export value declined due to lower prices. Further, India's lab-grown diamonds market is predicted to grow at a slightly higher CAGR than the global market. While India is a major hub for diamond processing and polishing, there is a significantly higher value add from domestic production of lab-grown diamonds. This will reduce India's dependence on imports of rough diamonds as well as on machines, diamond seeds and technology, while also moving the industry up the value chain toward technology-led manufacturing and branded retail. Lab-grown diamonds are aligned with India's broader goals of manufacturing growth, export diversification, and technological advancement. The Indian government's support is also encouraging growth via measures such as no customs duty on the import of diamond seeds and the 5-year research grant of INR 242.96 crores provided to IIT-Madras – the first such grant - to encourage the indigenous production of machinery and seeds required for lab-grown diamonds and the technology and recipe to manufacture them.

Looking ahead, India can emerge as a global leader in lab-grown diamond production through additional policy support, access to affordable renewable energy sources, and better integration into global supply chains. Some other measures include strengthened certification frameworks, investments in advanced production technologies, and increasing awareness through branding around 'made in India LGDs'. An overall alignment of these efforts will position India to shape the future of the global diamond industry.



2. FROM MINE TO MACHINE: THE DIAMOND STORY EVOLVES



Natural Mined Diamonds

The story of diamonds begins with the Indian civilisation. Written accounts about diamonds found along riverbeds exist in Indian literature and Hindu religious texts* from as early as the 4th century BCE. India was the only source of diamonds in the world from the 4th century BCE until 1725 AD when diamond deposits were discovered in Brazil. In the 1800s, just as the Indian diamond mines were dwindling, diamonds were discovered in huge quantities in South Africa and other parts of the African continent.

Ancient Hindu religious texts refer to diamonds used as talismans for warding off the evil eye. Diamonds were worn by maharajas and maharanis as jewels and had already found use as cutting tools. There are ancient treatises dedicated to the grading and study of diamonds. In the medieval era, diamonds were thought to have healing properties when ingested in tiny quantities.

Some of the rarest and most coveted diamonds in the world, such as The Hope Diamond and The Koh-i-Noor Diamond, originated in the famous Golconda mines of India. For almost 2000 years, Golconda diamonds were the only known fine diamonds. Many fables and myths are told regarding the early diamond mining activities in India, such as the tale of the Valley of Diamonds popularised in the stories of Sindbad the Sailor*. Unfortunately, the exact location and techniques used in most of India's diamond mines, including the Golconda mines, are now lost or erased from living memory.

The Tale of the Valley of Diamonds

This tale seems to have originated via the troops of Alexander the Great (356-323 BCE) returning from India. It also appears in Marco Polo's travelogues (1254-1324 AD) and has since been told and re-told through the ages. The fairy tale described a deep, rocky valley filled with diamonds and jewels. The valley was said to be inaccessible and protected by poisonous snakes. The merchants devised an ingenious solution to acquire the diamonds. They would throw raw meat into the valley, hoping to attract eagles. The diamonds would stick to the greasy meat and would be carried by the eagles to the top. The merchants would then scare the birds away and separate the diamonds from the meat.

For centuries, the sparkly gemstone has fascinated humankind for its aesthetic properties. The mining and distribution of natural diamonds has been the subject of frequent controversies, such as the sale of 'blood diamond' or conflict diamonds. It is no wonder that diamonds have such a rich and bloody history.

A diamond is a solid form of pure carbon with its atoms arranged in an isotopic crystal structure. Diamonds have the highest hardness and thermal conductivity of any natural material. In fact, a diamond is 58 times harder than any other natural material on earth. Natural diamonds are formed over billions of years deep in the core of the earth and are carried to the surface through volcanic eruptions in deposits known as kimberlites. The youngest natural diamond is over a billion years old.

Lucy In The Sky With Diamonds

Although the diamonds mined from earth are rare, diamonds are quite common in space. It is predicted that there is diamond rain on Uranus and Neptune. Fifty light-years away from Earth is a dwarf star named Lucy (after the famous Beatles song), which is possibly the galaxy's largest diamond - weighing 10 billion trillion trillion carats. Lucy is a dying star whose surface has completely (over 90%) crystallized into a diamond. One would need a jeweller's loupe the size of the sun to grade this diamond!

The most famous use for diamonds, even today, is gemological, i.e., in jewellery. The use of diamonds as cutting tools evolved through the Industrial Revolution, and today, there are fascinating and revolutionary uses of diamonds across many industries, which we will cover in the following sections. It is worth noting that although diamonds have been coveted by mankind for centuries, they became the symbol of marriage only in the 20th century, through the magic of marketing campaigns* and storytelling.

The De Beers Monopoly

The concept of engagement rings existed among the European aristocracy since the 15th century, although ruby and sapphire had been the choice gemstones. In the 1950s, De Beers, which by then owned most of the mines in Africa, began working on a marketing strategy for diamonds, which is regarded as one of the most successful marketing campaigns in the world. The campaign 'A Diamond is Forever' created an insatiable demand for the 1-carat diamond engagement ring - a tradition that holds true even today. De Beers' advertising campaigns were persuasive and carefully curated, and soon, diamonds became synonymous with marriage and a symbol of deep, everlasting love. Thanks to their huge marketing spend, wholesale diamond sales in the US increased in a span of 40 years from USD 23 million in 1939 to USD 2.1 billion by 1979.

De Beers controlled 80% to 85% of rough diamond distribution from its inception in 1888 until the start of the 21st century and was considered a monopoly. De Beers had the power to stockpile and withhold the supply of diamonds, thereby controlling the demand and pricing in the diamond market. Competition, along with a shift in customer preference, has since dismantled the near monopoly, and today, the De Beers Group now sells approximately 29% of the world's rough natural diamond production.]

Lab-Grown Diamonds

The first lab-grown diamond (LGD) was successfully created in 1954 in the General Electric (GE) laboratories. This initial diamond was of poor quality and too small for gem use. Today, many decades later, advanced technology has allowed laboratories to grow high-quality diamonds that are indistinguishable from natural diamonds without the use of special equipment.

Manufacturing Processes

There are two main manufacturing technologies used to create lab-grown diamonds, although other methods also exist, such as explosion or cavitation methods. Both methods begin with a small diamond seed, which may be a natural diamond or lab-grown. The entire process may take between 1 to 4 weeks.

• High-Pressure High-Temperature (HPHT)

The original method is the high-pressure, high-temperature (HPHT) method, which involves using a diamond seed and large presses to mimic the diamond-forming conditions in the earth's mantle. The process can create temperatures of about 1,500 °C and produce a pressure of 5 GPa (approximately 1.5 million pounds per square inch in a chamber).

The HPHT method can also be used to enhance or improve the colour of a natural mined or CVD-grown diamond to colourless (which has the highest grade) or any other desired colour. This treatment is permanent and does not change the physical properties of the diamond, only the colour. Note that for colour treating a natural mined diamond, the diamond must be flawless and without any impurities or imperfections.

• Chemical Vapor Deposition (CVD)

The second method is a newer technology called Chemical Vapor Deposition (CVD), which creates a carbon plasma over a diamond seed in a controlled chamber, allowing the carbon atoms to stick to the seed and begin growing a diamond. The CVD method opened new possibilities for mass-producing larger, high-quality diamonds at a relatively low cost.

• Difference between HPHT and CVD Diamonds

The CVD method uses smaller and less mechanically intense machines than the HPHT method. CVD diamonds, thus, tend to be cheaper than HPHT diamonds and more widely available. While both methods can produce diamonds that are high-quality and exactly similar in properties to natural mined diamonds, there are small differences between the two processes.

Firstly, HPHT diamonds can have certain metallic inclusions or can be affected by boron, which causes a blue hue. On the other hand, CVD diamonds can have brown or yellow tones and may need post-growth colour treatment using the HPHT method.

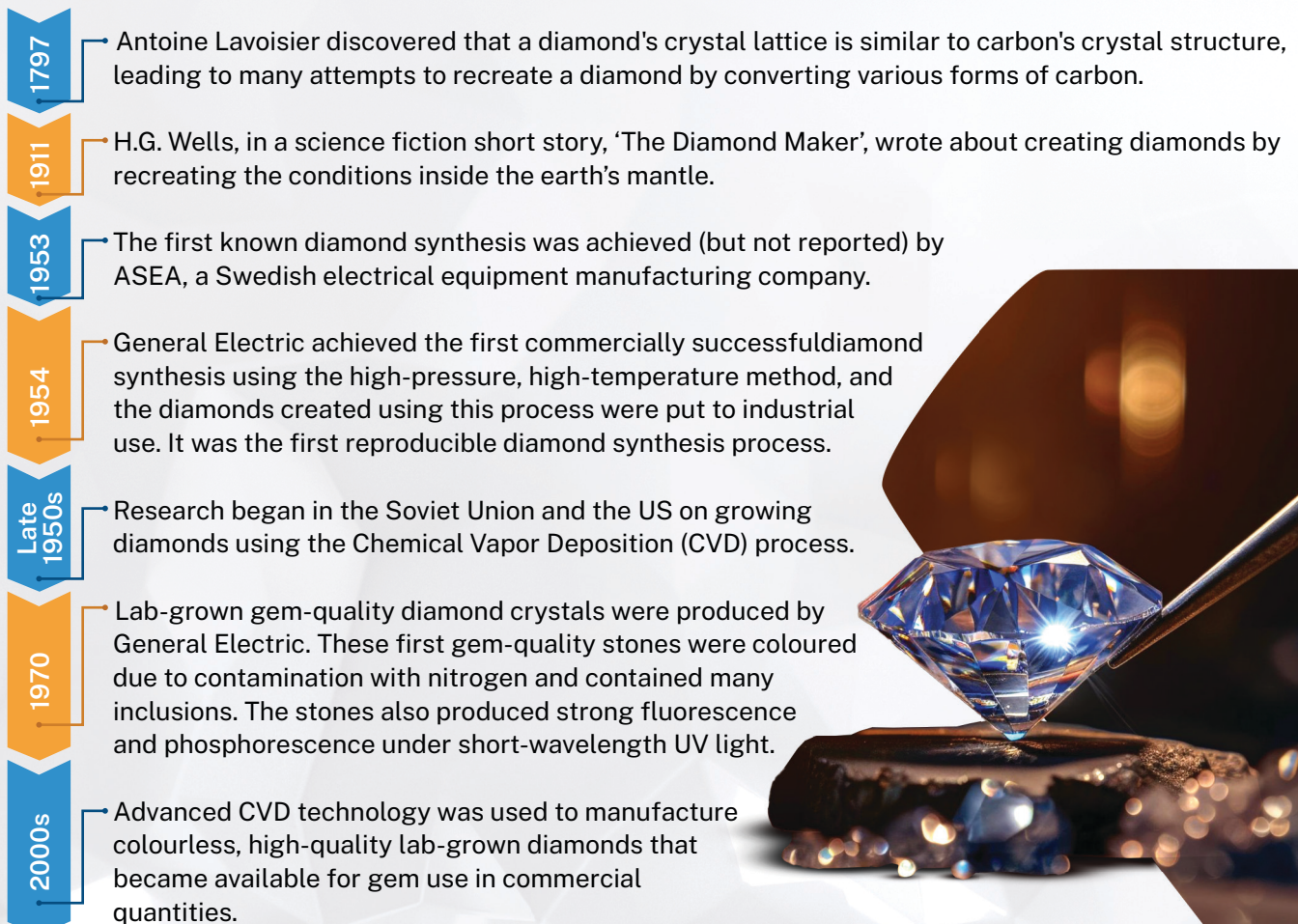
Another difference is that HPHT diamonds are grown in a cuboctahedron shape, whereas CVD diamonds are grown in a cube shape. Further, HPHT diamonds grow in 14 directions, thus allowing more control and precision with respect to the clarity and colour of the diamond.

India is a leading manufacturer and exporter of diamonds grown using CVD technology. China, on the other hand, which accounts for 40-50% of the world's lab-grown diamonds market, mainly uses the HPHT method for manufacturing diamonds.

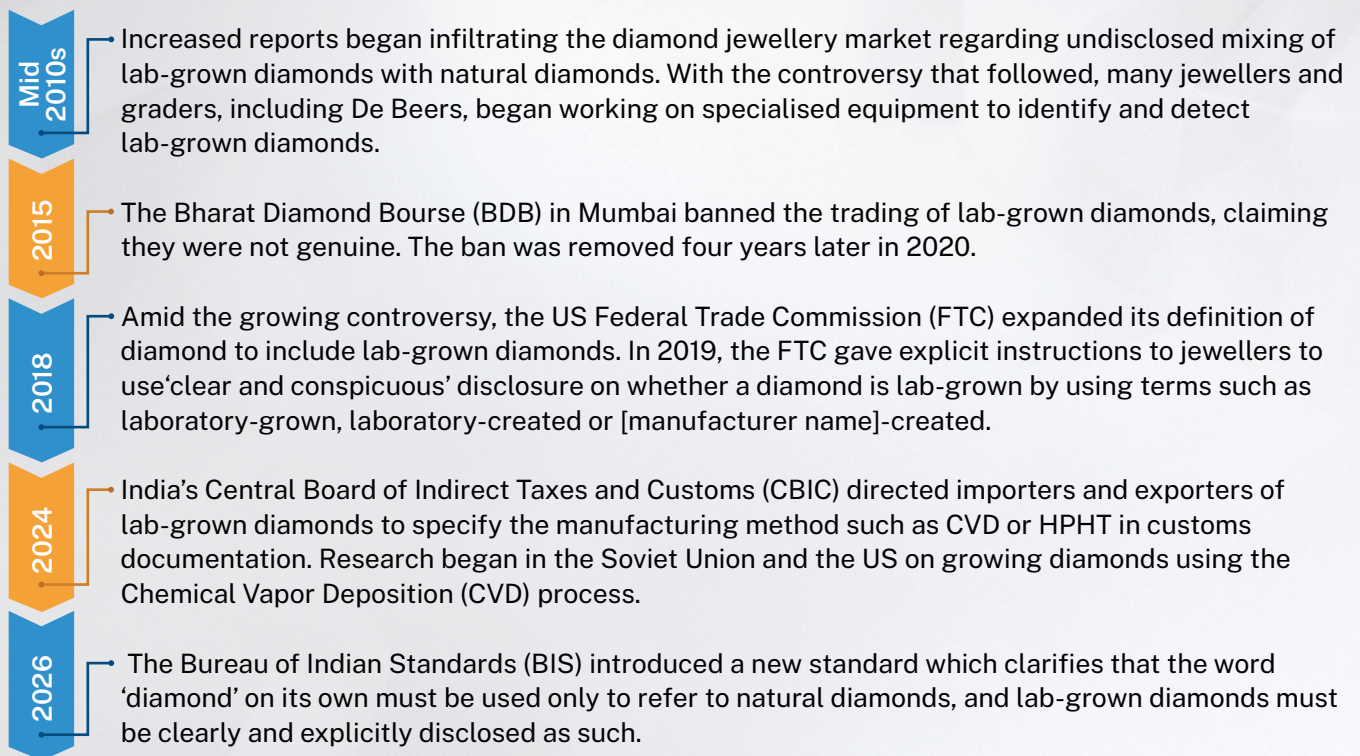
Once rough diamonds are manufactured, the cutting and polishing techniques are the same as those for natural mined diamonds. Approximately 80-90% of the diamonds sold in the world, natural or lab-grown, are cut and polished in Surat, India.

◆ Lab-Grown Diamonds: A Timeline

1. Creation of the Lab-Grown Diamond



2. Controversy and Regulation:



3. Commercial Acceptance of Lab-grown Diamonds:

1. De Beers Reverse Strategy: De Beers entered the lab-grown market with its brand Lightbox after having previously stated that it would never sell lab-grown diamonds. Lightbox aimed at selling lab-grown diamonds at fixed, transparent prices. However, in 2025, owing to declining prices of lab-grown diamonds and shifting market dynamics, the De Beers Group announced plans to shut down Lightbox, signalling a renewed focus on natural diamonds along with a planned expansion in the industrial lab-grown diamonds segment via its lab-grown diamond manufacturing brand, Element Six. As of 2026, plans are underway regarding the sale of De Beers by its parent company, Anglo American, as part of a broader restructuring strategy.

2. Retail Acceptance: Lab-grown diamonds saw broad and growing adoption among major and emerging jewellery retailers such as Pandora, Signet, and Swarovski. Pandora launched multiple lab-grown diamond jewellery collections, and Swarovski rolled out its Created Diamonds range internationally. Other independent retailers such as Limelight Diamonds and GIVA are also expanding their lab-grown diamond footprints, particularly in Indian markets.

3. Consumer Awareness: According to The Plumb Club's 2025 Industry and Market Insights report, the overall consumer awareness of lab-grown diamonds increased from 10% in 2010 to 84% in 2025.

4. Growing Market Share: According to Paul Zimnisky Diamond Analytics, in 2022, lab-grown diamond jewellery sales crossed 10% of global diamond jewellery sales for the first time (as compared to 3.5% in 2018). As of 2023, the share of lab-grown diamonds in the global diamond market was around 22%.

5. Market Value: The diamond market was estimated at around USD 42.7 billion in 2025, according to Grand View Research, and is projected to reach USD 53.16 billion by 2033, reflecting a Compound Annual Growth Rate (CAGR) of 2.7%. 78% of this market comprises of natural diamonds, with the balance 22% taken up by lab-grown diamonds.

3. NATURAL VS LAB-GROWN DIAMONDS: A COMPARISON



Lab-grown diamonds are chemically and physically identical to natural mined diamonds, including properties such as extreme hardness, high thermal conductivity, and high electrical resistivity. It is impossible to distinguish between a natural and lab-grown diamond on sight or even using a diamond loupe. However, with specialised equipment, it is possible to identify a lab-grown diamond. For instance, natural diamonds or diamonds grown using the HPHT method have minuscule amounts of nitrogen atoms, which are absent in diamonds grown using the CVD method. Advanced testing using specialised equipment is required to analyse diamond strain patterns, element composition, inclusions, fluorescence, phosphorescence, etc. to distinguish between lab-grown and natural diamonds.

We examine below how lab-grown diamonds compare to natural mined diamonds on a range of factors.

The 4 Cs

It is common knowledge to look for the 4Cs (a grading system created by De Beers in 1939) while purchasing a diamond: cut, colour, clarity, and carat weight. The 4Cs are now a universal standard for assessing the quality of a gem-grade diamond.

Cut: This has traditionally been the most important criterion for choosing a gem-quality diamond. Lab-grown diamonds contain fewer imperfections than natural rough diamonds, whereas generally, only 2% of natural diamonds are free of imperfections. Therefore, the cut is usually more precise and controlled for lab-grown diamonds. In 2025, elongated fancy diamonds became the trend, surpassing the classic round diamond shape. Consumers showed increased preference for oval or cushion elongated diamonds, with specifications regarding brilliance and proportions that are more easily met by lab-grown diamonds than natural mined diamonds.

Colour: Lab-grown diamonds can be white or colourless, but many are fancy-coloured, as against only 0.01% of natural diamonds which are coloured. The grade is higher for a stone that is colourless.

Clarity: Since lab-grown diamonds are created under controlled conditions, they are more likely to receive higher quality grades than natural mined diamonds. However, they may also contain inclusions.

Carat: The biggest natural mined diamond is the Cullinan Diamond, which weighed 3,106 carats in its rough diamond form. Lab-grown diamonds manufactured under the HPTP method generally grow up to 10 or 15 carats. In June 2023, India's Ethereal Green Diamond laboratory created the biggest lab-grown diamond to date using CVD technology: an emerald-cut, 50.25-carat, type IIa diamond named "Shiphra" and graded by the International Gemological Institute (IGI). In May 2024, the same manufacturer created a 75.33-carat CVD Diamond named "Celebration of India", which is one of the largest faceted certified lab-grown diamonds created till date. The most common carat weights for gem-quality lab-grown diamonds are between 1 and 3 carats.

The same 4Cs grading standard can also be applied for lab-grown diamonds. Gem labs are required to state in their grading report whether the diamond is natural or lab-grown and whether the diamond has been subject to post-growth treatment. In June 2025, the Gemological Institute of America (GIA) announced that it will no longer apply the 4Cs terminology of colour and clarity for lab-grown diamonds, instead simply using simplified descriptive categories such as "premium" and "standard" to distinguish lab-grown diamond quality.



Origin

The only real difference between a natural and lab-grown diamond is its origin. Mined diamonds are formed in the mantle of the earth over billions of years. The youngest mined diamond is at least a billion years old. This makes diamonds one of the rarest natural resources on earth, but more importantly, the imperfections found in natural rough diamonds have allowed scientists to study the processes that occur deep inside the earth's core. Studying rough diamonds and kimberlite pipes has given scientists a better understanding of the tectonic plates, the topography of the earth, and the emergence of continents.

Price

For decades, diamond pricing was in the hands of De Beers, which was a near monopoly until the 2000s. De Beers carefully controlled the supply while creating demand for diamonds using persuasive marketing, thus inflating the prices of polished diamonds. Today, the price of gem-grade diamonds is influenced by demand and supply factors and the mark-up by jewellery stores.

Depending on the size, colour, and clarity, as of early 2025, a lab-grown diamond was 70-90% cheaper than a comparable natural diamond according to analyst Paul Zimmisky. This is because the cost to produce a diamond is relatively low and because the supply chain is shorter than that for natural diamonds. Further, technology-based manufacturing directly cuts down the capital and labour-intensive factors that make up the mined diamond chain.

Resale Value

Unlike gold or silver, a diamond does not have an inherent resale value because it cannot be melted or cut and polished to create a different piece of jewellery. The resale value of a diamond depends on the 4Cs and the demand and supply factors that influence the pricing of a diamond. Usually, an engagement ring or other diamond jewellery made with natural diamonds has a resale value between 20-40% of its cost.

The resale value of a lab-grown diamond is lower than that of a natural diamond, sometimes even negligible, because it is not perceived as a rare or precious stone. But lab-grown diamonds are also much cheaper, thus giving them the upper hand in terms of the net cost of owning and resale.

Environmental Impact

Diamond mining is not sustainable, primarily because the supply of diamonds on earth is limited and will be depleted. According to the 2023 US Geological Survey, many large diamond mines in the world are estimated to have passed their peak production levels and may close by 2030.

Diamond mining techniques also cause carbon emissions, displace land and ecosystems, and harm the natural environment by polluting the water and soils. Recently, mining companies are taking increasing efforts to offset the extensive land displacement and environmental damage via conservation programs.

Lab-grown diamonds are often considered a sustainable alternative to natural mined diamonds since manufacturing does not involve depleting a natural resource. Diamond mining can generate 2.63 tonnes of mineral waste per carat, compared to just 0.0006 tonnes for lab-grown diamonds, alongside water consumption of around 0.48 m³ per carat versus 0.07 m³ for lab-grown production, according to a 2024 study published in Nature (Humanities & Social Sciences Communications) based on underlying 2014 data from Frost & Sullivan. According to Clean Origin, a leading jewellery designing company, 1 carat of a lab-grown diamond displaces 0.07 square feet of land as against 100 square feet per carat of mined diamond and generates only 1 lb of mineral waste as against almost 6,000 lbs of mineral waste per carat of mined diamond.

This is not to say that a lab-grown diamond is free of a carbon footprint since the manufacturing process involves the use of fossil fuels and non-renewable sources of energy to achieve the temperature and pressure required. Further, over 75% of lab-grown diamonds of the world are manufactured in China and India, where, according to the Energy Institute Statistical Review of World Energy 2024, 61% and 75% of grid electricity respectively is generated from coal.

Many lab-grown diamond manufacturers such as Diamond Foundry, WD Lab Grown Diamonds, and Swarovski, are increasingly attempting to shift to 100% renewable sources of energy for growing diamonds. Some examples are as follows:

- In 2018, the International Institute of Diamond Grading and Research (IIDGR) which is part of the De Beers group, installed a solar-powered roof at its grading plant in Surat.
- De Beers' brand Lightbox announced in June 2023 that its lab-grown diamonds have been certified as carbon neutral by global climate consultancy Carbon Trust. The diamonds are grown using 100% renewable wind energy, which reduces their potential emissions by 79%.
- Pandora's lab-grown diamonds are manufactured using 100% renewable energy sources, and are set in jewellery which is crafted from 100% recycled gold and silver, resulting in a carbon footprint which is overall 95% lower than that of comparable mined diamonds.
- Greenlab Diamonds (India) has announced investments in solar energy installations to power some part of its CVD diamond growth operation.

Conflict Diamonds

A conflict diamond (or blood diamond as made famous by the movie) is a diamond mined in a war zone and sold for funding armed conflict against governments. Because it is impossible to track the exact source of a natural diamond, in 2003, the Kimberley Process Certification Scheme (KPCS) was created, which certifies diamonds as conflict-free and proves their origin. India became compliant with the scheme from its implementation in 2003 and is set to chair the Kimberley Process in 2026, positioning its role in discussions regarding ethical governance within the global diamond trade. Members of the KPCS together account for 99.8% of the diamonds produced worldwide. Unfortunately, the Kimberley Process does not certify worker and health/safety conditions at a mine. Further, once a diamond is cut and polished, its traceability reduces.

De Beers, in collaboration with the diamond industry, has developed an end-to-end blockchain platform which will enable tracing a natural diamond from its origin to the end customer to increase buyer confidence. De Beers has announced that by 2030, it will provide the origin and supply chain of every diamond it discovers.

In contrast, lab-grown diamonds are considered conflict-free and eco-friendly – a characteristic that appeals to GenZ and millennial generations, who are the next big buyers of diamond jewellery.



4. BEYOND ROMANCE: WHY DIAMONDS MATTER MORE THAN EVER



For decades, diamonds have been advertised as the symbol of love and commitment. The famous De Beers slogans are still etched in people's minds and in pop culture: 'A Diamond is Forever' or 'Diamonds are a girl's best friend'.

The jewellery segment dominates over 65% of the market share of the global diamond market. However, a majority of natural mined diamonds are unsuitable for use in jewellery and are used industrially. Lab-grown diamonds found industrial applications almost immediately after their invention in the 1950s. Most lab-grown diamonds are produced as grit or small crystals used to provide hard coatings for industrial equipment. Diamond films can be grown on various materials by subjecting carbon-containing gas to extreme heat. Such layers are used in cutting tools, windows for optical devices, or substrates for semiconductors. Over 95% of diamond grinding grit is currently of lab-grown origin.

Diamonds have extraordinary chemical properties that make them a unique material for applications in electronics, high technology, semiconducting, and many more. Because natural mined diamonds were priced high and their supply was controlled, research on scientific and industrial applications of diamonds was limited. A single high-quality natural diamond would be split up between multiple research teams. Now, with the entry of high-quality lab-grown diamonds into the market at affordable prices, research is advancing at a terrific pace. With so many versatile uses, lab-grown diamond manufacturers are also building larger reactors and manufacturing diamonds customised per application and industry segment.

We examine below the industrial uses of diamonds, i.e., other than jewellery:

Drilling

Diamonds being one of the hardest and most durable materials on earth (scoring a 10/10 on the Mohs Hardness Scale), they are widely used for drilling. Diamond particles are added to the edges of saws and drills to make the drills tougher and more powerful. Diamond saws and drills are used in various industries, including:

- **Automotive:** Diamond saws and drills are used as an integral part of the manufacturing of vehicles. Diamond drills are used to cut and finish engine components and car bodies. Diamond-coated grinding wheels are also used to polish the glass in windows.
- **Mining:** Diamond drills work better than any other material to drill into rock or metal. Oil and gas and mining companies are researching potential uses of diamond drills to crack the rock beneath the earth's surface.
- **Dentistry:** Many dental tools include diamond tips for drilling cavities since diamonds make the tools more durable and abrasive.

Construction

Diamond-coated equipment is used by many highway construction companies to groove and cut pavement and repair roads. Increasingly, construction sites are providing workers with diamond tools depending on the type of application, such as cutting through concrete, polishing floors, and drilling and excavation.

Defence and Military

Lab-grown diamonds are used to make high-energy laser weapons and are also being used in radar equipment, electronic warfare and communication systems, high-precision machine manufacturing, aerospace optical devices, etc. In aerospace and military optics, diamond optical windows and lenses are valued for their durability and resistance to shock and thermal stress, making them suitable for fighter jet sensor domes, missile guidance systems, and spaceborne surveillance instruments. Diamonds are also being explored for high-energy defence electronics, satellite payloads, and quantum sensing technologies that could contribute to future navigation systems.

Laser Beams

Researchers have succeeded in using diamonds to concentrate a flash of light onto a laser beam that was powerful enough to cut through steel. Diamond lasers have vast applications, including in defence, space communications, tracking and removing space debris, and measuring coordinates by reflecting light off a satellite. Diamonds are able to generate powerful laser beams at wavelengths or colours which can interact or transmit via various target materials.

Electronics and Semiconducting

Diamonds have strong thermal conductivity, making them useful materials for heat sinks. One of the first applications of lab-grown diamonds was as heat sinks in telecommunication components.

Researchers are also using diamonds to make transistors that are smaller in size by up to 90%. Another study found that diamonds can conduct electricity in a manner similar to metals when it is deformed to strains at a nanoscale. This find has applications in high-voltage, high-power electronics such as electric vehicles and trains, switches at power stations, light-emitting diodes, transistors, radio frequency (RF), satellites, wireless systems and 5G networks. Diamonds may replace vacuum tubes in high-power communications broadcasting and radar.

Scientists are also turning to diamonds as efficient ultra-wide bandgap semiconductors. Diamond is an efficient heat-flux substrate, i.e., it prevents overheating, and controls heat better (near room temperature) than silicon in semiconductor applications. Lab-grown diamonds in single crystalline form are thus the closest option to replace silicon semiconductors, which consume a lot more energy. Diamond semiconductors have shown to outperform silicon semiconductors by a factor of 17,200 times, according to Diamond Foundry, a US-based manufacturer which is developing single-crystal diamond wafers specifically for semiconductor applications.

Diamond semiconductor devices are being researched as a next-generation wide-bandgap semiconductor material due to its exceptional physical properties, including very high thermal conductivity and a breakdown electric field several times higher than that of silicon. Although modifications are required in order to achieve commercial success for diamond semiconductors, the technology is expected to replace silicon semiconductors and revolutionize the electronics industry in the coming years.

Quantum Computing

Once lab-grown diamonds became commercially available, companies began making diamonds for research purposes where previously high-quality diamonds were hard to come by. One important field of research has been quantum computing. Research is being conducted on encoding information inside a diamond by manipulating its impurities with a laser. While early experiments demonstrated entanglement between only a small number of qubits, subsequent research has enabled multi-qubit registers and small-scale quantum networks within diamond systems, further, scalability remains a major issue. However, the use of custom-made lab-grown diamonds may overcome the challenges faced by physicists in creating practical quantum computers.

Physicists are also experimenting with using the nitrogen-vacancy (NV) centre diamonds to make magnetic sensors, magnetometers (an alternative to GPS), and in the medical industry to enhance magnetic resonance imaging (MRI) and study the magnetic fields of neurons in human heart cells.



Nuclear Diamond Battery

Nuclear diamond batteries are being made from nanodiamonds, which act as a semiconductor and a heat sink. Researchers have found a way to use energy released by nuclear or radioactive waste to power synthetic nanodiamonds, which then generate electricity. In 2024, scientists at the UK Atomic Energy Authority and Bristol University created the first carbon-14 diamond battery, which has the potential to power devices for over a thousand years.

Medicine

Nanodiamonds have many uses in the field of medicine. Diamonds are used in the blades for surgical knives. Nanomaterials are biologically compatible materials and are being used for drug administration. Nanodiamonds (with attached molecules) are able to penetrate the blood-brain barrier and deliver chemotherapy drugs to cancer cells without producing any negative effects as delivery agents. Nanodiamonds were also used in a laser-based optical method to trace cancers by allowing nanodiamonds to penetrate within body tissue in a non-invasive manner and eliminate the need for a biopsy. The use of nanodiamonds has also been demonstrated in skincare, surgery, and in-vitro diagnosis, and further research is ongoing.

Audio Equipment

Diamonds have a very tight molecular structure, and therefore, diamond domes are used in extremely high-grade speakers to deliver the highest frequencies without warping. Diamonds are also used in high-end record players as needle tips.

Among the applications outlined above, diamond semiconductors are currently the most promising technological leap, as well as the uses of diamonds in quantum computing, medicine, etc. Boron-doped diamond electrodes have been successfully used on hard-to-treat wastewater and for water purification. In 2025, researchers discovered that boron-doped diamonds exhibit plasmons (waves of electrons that move when light hits them), which allows electric fields to be controlled and enhanced on a nanometre scale. This breakthrough may result in new types of biomedical and quantum optical devices which are faster, more efficient, and capable of processing information in ways that classical technologies cannot.

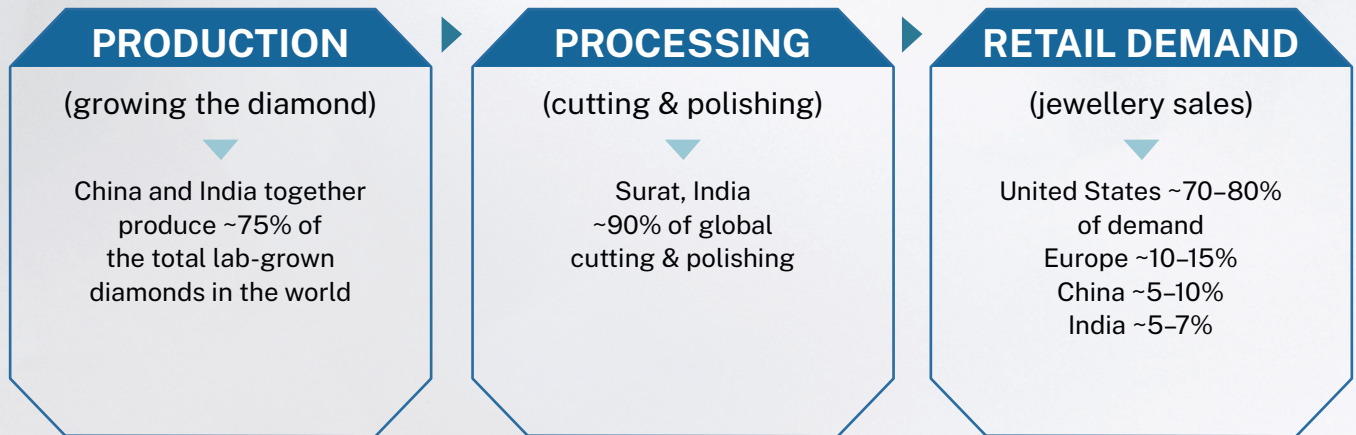
With increasing research and technological advancements, diamonds are thus poised to become the new material to spur the next industrial and technological revolution. The growth in these applications and industrial sectors will directly impact the demand for lab-grown diamonds across the globe in the coming years.



5. PRICE OF BRILLIANCE: THE ECONOMICS OF LAB-GROWN DIAMONDS



In the traditional natural diamond industry, the supply chain used to be much simpler. Diamond were mined in Africa, cut and polished in India, and sold in the US. With the entry of lab-grown diamonds, the typical supply chain of a diamond produced in a lab becomes more complex. Below is a snapshot of the global supply chain of lab-grown diamonds:



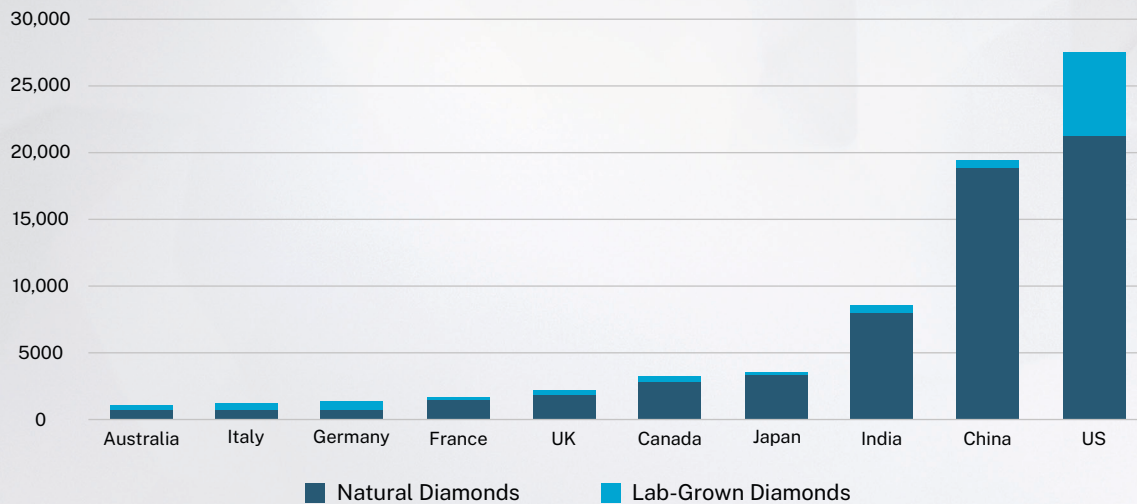
According to Paul Zimnisky Diamond Analytics, lab-diamond jewellery sales crossed 10% of global diamond jewellery sales for the first time in 2022 (as compared to 3.5% in 2018). In 2022, many retailers stepped up to incorporate lab-grown diamonds in their jewellery collections, including brands such as Signet, Pandora, and Swarovski. Pandora announced that it will switch over from natural mined diamonds and exclusively use lab-grown diamonds in their jewellery line. Further, Pandora's lab-grown diamonds are manufactured using 100% renewable energy sources, and are set in jewellery which is crafted from 100% recycled gold and silver, resulting in a carbon footprint which is overall 95% lower than that of comparable mined diamonds.

Some key statistics related to the global lab-grown diamonds market are as follows:

- ◆ The global diamond market was estimated at around USD 42.7 billion in 2025, according to Grand View Research, and is projected to reach USD 53.16 billion by 2033, reflecting a Compound Annual Growth Rate (CAGR) of 2.7%. 78% of this market comprises of natural diamonds, with the balance 22% taken up by lab-grown diamonds.
- ◆ On the other hand, the global lab-grown diamonds market was valued at USD 29.46 billion in 2025 and is projected to grow from USD 33.54 billion in 2026 to USD 91.85 billion by 2034, reflecting a CAGR of 13.42%, according to Fortune Business Insights.
- ◆ Over 75% of the world's lab-grown diamonds are produced by China and India, of which around 55-60% is produced in China using the HPHT method, while around 25-30% is produced in India, largely using the CVD method.
- ◆ Around 70-80% of the demand for lab-grown diamonds originates in the US, driven primarily by strong adoption in the engagement ring and fashion jewellery segments. In 2024, lab-grown diamonds accounted for over 45% of engagement rings in the US in 2024.

Diamond Jewellery Sales: Natural vs Lab-Grown 2024

Retail RSP, USD million (current, y-o-y exchange rate)



Source: Euromonitor International estimates, 10 selected markets

Global Diamonds Market and Pricing Dynamics

Natural Diamonds

Until the 2000s, natural diamond prices were under the control of De Beers, which had a monopoly and owned ~85% of the diamond market for almost a hundred years, beginning in the late 1890s. De Beers created artificial scarcity by stockpiling diamonds to further their perception as rare jewels. De Beers also used persuasive marketing techniques, and thus, the prices of diamonds were inflated. Since 2005, the prices of natural diamonds are no longer under monopoly and are subject to normal pricing laws of demand and supply. De Beers Group now sells approximately 30% of the world's rough diamond production by value.

However, the supply of natural diamonds has been steadily dwindling as it depends on kimberlite discoveries, which have been low. In November 2020, the Argyle mine in Australia closed down after 37 years of operations. The Argyle mine was famous for its pink diamonds, and at its peak in 1994, Argyle was once the world's biggest source of natural diamonds. Several other mines have also closed operations, with other mines reaching near-term closure by the end of the decade.

The global rough diamond supply declined by 22% in 2021. Natural diamonds production is estimated to have reached its peak in 2006, with an average of 175 million carats. According to Paul Zimnisky, presently, the annual production of natural diamonds is between 115-125 million carats, as compared to 150 million carats recorded in 2017. According to the industry overview by Petra Diamonds, presently, there are only 30 significant diamond mines in production, of which only 7 are considered Tier 1 deposits. Further, the success rate of diamond exploration is estimated at less than 1%.

Between 1960 and 2016, the prices of natural diamonds increased by around 3% each year. In 2020, owing to the COVID-19 pandemic, the sale of diamond jewellery fell by around 15%, with the sale of rough diamonds falling by 31%. However, the recovery for diamond sales was surprisingly good, as demand for diamonds shot up rapidly in 2021, particularly in the US. According to a report by Bain & Co., the recovery led to an increase higher than pre-pandemic levels at 13% over pre-pandemic levels in the diamond mining segment, 16% for cutting and polishing, and 11% for diamond jewellery retail, respectively.

However, following this brief surge, the natural diamond industry faced renewed pressures. At the end of 2024, De Beers reported inventory levels of natural diamonds worth roughly USD 2 billion, its largest stockpile since the 2008 financial crisis according to the Financial Times. Further, owing to the Ukraine-Russia conflict and sanctions on Alrosa, one of the world's largest diamond producers, the global supply of mined diamonds was significantly disrupted. Alrosa reported a 77.3% fall in 2024 net profit year-on-year. The sanctions, however, boosted the sales of lab-grown diamonds as well as non-Russian natural diamonds such as De Beers and Botswana-based Anglo.

The Rapaport Diamond Index (RAPI), which is the diamond industry standard for the pricing of diamonds, fell in 2023, reflecting weak retail sales in China and the US. De Beers cut prices across various categories of diamonds by more than 40%. By 2025, the market had weakened further owing to slowing demand for natural diamonds, rising inventories, and increased competition from lab-grown diamonds as compared to natural diamond prices.

The RapNet Diamond Index (RAPI) reflects falling prices across 0.3, 0.5, 1 and 3-carat diamonds as follows:

RAPNET DIAMOND INDEX (RAPI™)				
	Index on Jan. 1, 2026	December 2026	4Q 2025	2025
RAPI 0.30 ct.	835	-9.3%	-18.5%	-20.3%
RAPI 0.50 ct.	1,244	-6.4%	-13.7%	-26.0%
RAPI 1 ct.	4,146	-2.3%	-6.5%	-9.9%
RAPI 3 ct.	18,208	0.3%	0.7%	-0.3%

Source: Based on RapNet data.

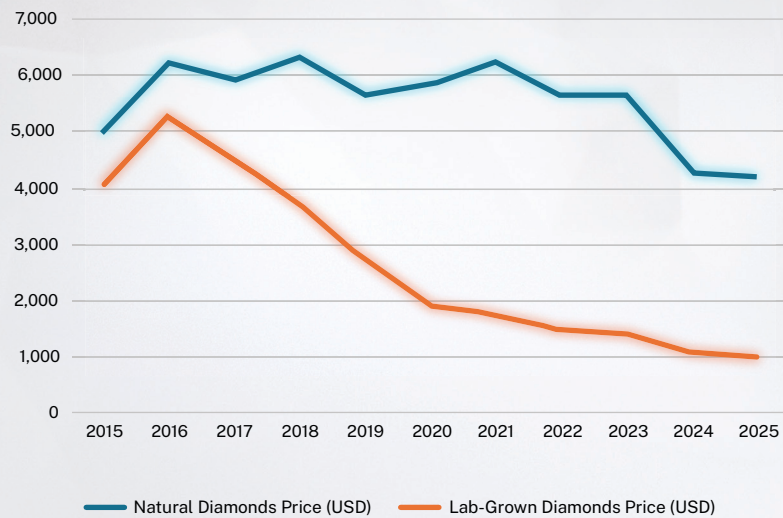
Lab-Grown Diamonds

The prices of gem-grade lab-grown diamonds were initially set in comparison to the prices of natural diamonds because they were marketed as the cheaper, eco-friendly, and ethical alternative. As the demand for lab diamonds increases from an industry standpoint, the prices will begin to diverge. Presently, the prices of lab-grown diamonds have been falling, mainly due to increased production and advances in technology. The fact also remains that lab-grown diamonds do not hold their value as well as natural mined diamonds.

Depending on the size, colour, and clarity, a lab-grown diamond can be 70-90% cheaper than a natural diamond. At the same time, it is important to note that just as with natural diamonds, the prices of lab-grown diamonds can fluctuate, depending on the carat, cut, shape, and colour. For example, a 15.71 carat lab-grown diamond from James Allen is priced at USD 48,650.

In 2020, the COVID-19 lockdowns affected the supply of raw materials required for manufacturing lab-grown diamonds. China is one of the primary suppliers of graphite required for manufacturing diamonds using the HPHT method. With the lockdowns, the supply chain of graphite closed down, leading to an overall decrease in lab-grown diamonds manufactured using the HPHT method. CVD lab-grown diamonds managed to maintain their leadership position in the market during this period. By 2025, the overall gems and jewellery market had entered a slowdown, reacting to weaker demand for natural diamonds in the US and China. A comparison of the price of a 1-carat lab-grown diamonds against the price of a similar natural diamond over the last 10 years is as follows:

Price Comparison - Natural Vs Lab-Grown Diamonds



The above data shows that:

- ◆ In 2015, a 1-carat lab-grown diamond was priced only 20% less than a natural mined diamond. By the end of 2015, the differential had widened to almost 80%.
- ◆ The prices of natural diamonds are on a decline but at a smaller rate than that of lab-grown diamonds.
- ◆ The price of a 1-carat lab-grown diamond fell by 75% between 2015 and 2026, as compared to a 15% fall in the price of a 1-carat natural diamond.

LGD Wholesale Price Declines are Tapering Off



Based on average wholesale transaction prices of round-shaped goods
Source: Edahn Golan Diamond Research & Data Ltd

The reason for the rapid decline in prices of lab-grown diamonds is that the cost to produce a diamond is relatively low using the CVD method (and expected to fall further) and because the supply chain is shorter than that for natural diamonds. According to a report commissioned by the Antwerp-based World Diamond Centre, in ten years, the cost to manufacture a CVD lab-grown diamond fell more than tenfold – from USD 4,000 per carat in 2008 to between USD 300 and USD 500 per carat in 2018. As per a 2025 report by the National Diamond Council (NDC), the wholesale price of a 1-carat lab-grown diamond has fallen to around 5% of its 2018 level. Edahn Golan, an analyst, claimed that another reason for the price decline was one lab-grown diamond producer sharply reducing the prices of its rough lab-grown diamonds, which in turn dragged down prices across the market.

Key Players in the Lab-Grown Diamond Market

Antwerp, Belgium, is recognized as the world's diamond market centre, however, the majority of diamonds are mined from Botswana, Russia, and Canada. Surat, India, is a global hub for cutting and polishing of diamonds (whether natural or lab-grown) and processes approximately 90% of diamonds sold in the world.

India and China together are estimated to account for almost three-quarters of the global lab-diamond jewellery production by volume.

Natural diamonds were under the De Beers monopoly until 2005, but for lab-grown diamonds, as the manufacturing technology advances, there is healthy competition, and more and more business players are entering the industry.

Some of the key players in the global lab-grown diamonds market are outlined below.

1. Element Six, part of the De Beers Group, is one of the world's leading producers of lab-grown diamonds for industrial and technological applications. The company has manufacturing facilities in Ireland, China, Germany, South Africa and the UK. Element Six manufactures diamonds for industrial applications in electronics, semiconducting, and abrasives. Element Six is also partnering with scientists and universities to develop diamond-growing technologies.

2. In 2018, De Beers entered the lab-grown jewellery market with its brand Lightbox after having previously stated that it would never sell lab-grown diamonds. Lightbox began selling lab-grown diamonds at a standard price of USD 800 per carat (as against the average of that time which was around USD 4,200 per carat). Lightbox was aimed at selling lab-grown diamonds at fixed, transparent prices. However, in 2025, owing to declining prices of lab-grown diamonds and shifting market dynamics, the De Beers Group announced plans to shut down Lightbox, instead focusing on the industrial lab-grown diamonds segment via its lab-grown diamond manufacturing brand, Element Six.

3. Diamond Foundry, based in the US, has raised investment from many celebrities, including Leonardo DiCaprio. Diamond Foundry claims to be the world's first zero-carbon-footprint producer of diamonds by using renewable energy. Diamond Foundry also develops diamond semiconductor wafers and electronic-grade synthetic diamonds.

4. India's Ethereal Green Diamond laboratory, in June 2023, created an emerald-cut, 50.25-carat diamond named "Shiphra". In May 2024, the same manufacturer created a 75.33-carat CVD Diamond named "Celebration of India", which is one of the largest faceted certified lab-grown diamond till date.

5. WD Advanced Materials (formerly WD Lab-Grown Diamonds) is a major producer of CVD diamonds in the US, with its diamonds used in jewellery as well as advanced industrial and electronic applications such as optics and thermal management systems.

6. New Diamond Technology is a leading developer of CVD diamonds in Russia. NDT generally produces large single-crystal lab-grown diamonds used in jewellery and high-tech applications.

7. Henan Huanghe Whirlwind is one of China's largest lab-grown diamond manufacturers. It produces diamonds using HPHT technology for industrial and jewellery markets.



6. INDIA'S DIAMOND SHIFT: FROM POLISHING TO PRODUCING



India is a leading manufacturer of lab-grown diamonds producing approximately 35-40% of all lab-grown diamonds in the world (ranking second in the world behind China). India is also a global centre for cutting and polishing of diamonds (whether natural or lab-grown), with approximately 90% of the diamonds sold in the world, natural or lab-grown, being cut and polished in Surat, India. There are approximately 5,000 diamond polishing units in Surat, out of which around 25-30% units are engaged in processing lab-grown diamonds according to industry estimates.

Market Size

As of 2022, India ranked first among the top exporters of cut and polished diamonds and second in lab-grown diamonds. According to a report by 1Lattice, India's lab-grown diamonds market is projected to grow from USD 350 million in 2024 to USD 1.2 billion in 2033, reflecting a CAGR of 15%.

India's gems and jewellery sector contributes around 7% to India's GDP and 10-12% to the country's total exports.

According to the Directorate General of Commercial Intelligence and Statistics, diamonds (other than industrial diamonds) cut or otherwise worked but not mounted or set, have consistently been one of India's top 5 highest commodities for export in the past 5 years. India's exports of polished lab-grown diamond grew six-fold from USD 225 million in 2019-20 to USD 1.3 billion in 2022-23, reflecting a CAGR of 70%. However, in 2024-25, exports of polished LGDs fell by 9.64% as compared to 2023-24. This decline is largely linked to the sharp decline in prices and uncertainties regarding US tariffs on India's diamond exports (explained in detail below). It is interesting to note that India's exports of lab-grown diamonds doubled in volume from 7.81 million carats in 2023-24 to 15.29 million carats in 2024-25, however, owing to falling prices, the overall exports value has declined.

Additionally, foreign direct investment (FDI) inflows in the gems and jewellery sector reached about USD 1.47 billion (₹13,273 crore) between April 2000 and June 2025, representing roughly 0.19% of India's total FDI equity inflows. The sector saw an 84% rise in inflows in the first half of FY2023-24, reflecting increasing investor interest.

India's top export destinations for LGDs are the US, Hong Kong, Belgium, UAE, and Israel. The US is the largest market for both natural and lab-grown diamonds. In March 2022, the Indian Government signed a Comprehensive Economic Partnership Agreement (CEPA) with the United Arab Emirates (UAE). The CEPA provides the industry with duty-free access to the UAE market. With the CEPA, trade between India and the UAE has increased significantly. At the IIJS Premiere in August 2023, the GJEPC announced that it is looking to boost exports of Indian diamonds in markets such as Cambodia, Vietnam, and Sri Lanka. India has also entered into several other recent trade agreements, including the India-Australia Economic Cooperation and Trade Agreement (ECTA) in 2022, and the India-EFTA Trade and Economic Partnership Agreement (TEPA) with Switzerland, Norway, Iceland, and Liechtenstein in 2024. Additionally, India has also concluded negotiations related to agreements with the UK and the EU, reflecting a diversification in diamond export destinations..

Significant Events Impacting the Market

India's diamonds sector has been through several economic overhauls, including the COVID-19 pandemic and geopolitical tensions such as the Russia-Ukraine conflict and the US tariffs on Indian exports.

COVID-19 pandemic: India's exports of gems and jewellery recorded the highest year-on-year decline at 19.37% in February 2020, and a 40.92% decline in the exports of cut and polished diamonds in the same period, according to the GJEPC. Cutting and polishing units in India relaunched production and by 2020-21, exports of India's gem and jewellery sector witnessed a growth of around 55% over the 2020-2021 period and 11% over the pre-COVID-19 level of exports.

Ukraine-Russia conflict: In 2023, sanctions on Alrosa, one of the world's largest diamond producers, led to significant restrictions on the global supply of mined diamonds. India imports a third of its rough diamonds from Russia. The sanctions resulted in many cutting and polishing units in Surat converting their set-up from natural diamonds to lab-grown diamonds, demonstrating that the existing polishing industry no longer needs to depend on the import of rough diamonds but can process made-in-India diamonds.

India-US Tariffs: In 2025, the US imposed 25% tariffs on India, which were later raised to 50%. This impacted the global market in the first half of 2025, with the industry attempting to reroute supply chains and redirect production to alternative centres such as Antwerp, which had secured a 0% tariff rate. The tariffs led to a significant decline in US polished imports from India and affected inventory levels in both India and the US. In Surat, where 80-90% of the world's diamonds are cut and polished, Indian manufacturers were forced to reduce their rough purchases and factory output to avoid accumulating polished inventory, resulting in layoffs and closures across small and mid-size factories. In February 2026, the US and India reached a deal to reduce the reciprocal tariffs to 18%. However, owing to these geopolitical tensions and also reacting to weaker demand for diamonds in the US and China, India's overall gems and jewellery exports saw an 11.72% decline year-on-year in 2024-25 as compared to 2023-24, according to the GJEPC.

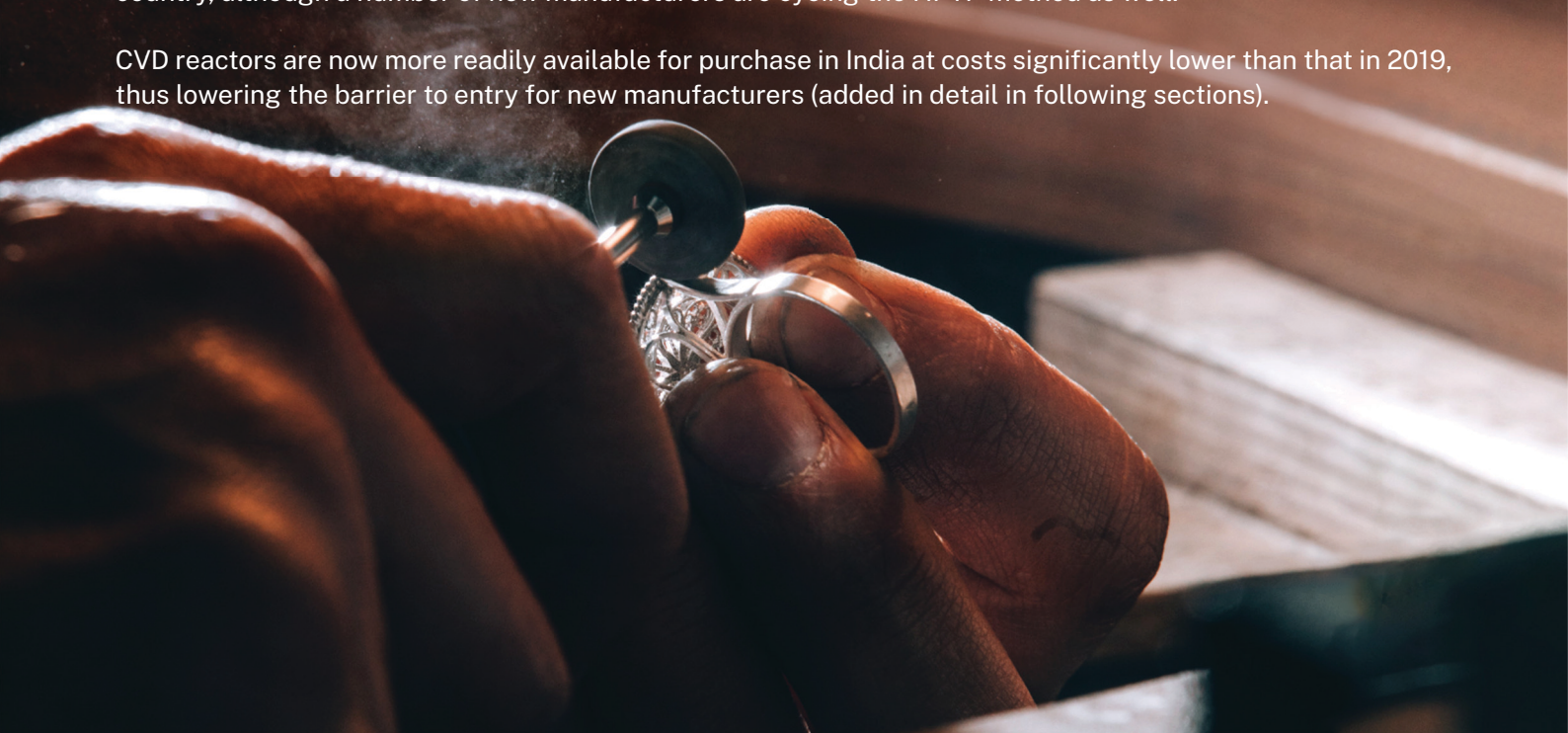
LGD Manufacturing Segment and Key Players

The global lab-grown diamond industry is expanding rapidly, creating significant opportunities for startups, investors, and established players. India leads the global lab-grown diamond startup ecosystem with over 35 startups, the largest in the world. This sector is also attracting foreign investment, as reflected by over USD 14 million in funding raised by Indian lab-grown diamond startups in the first quarter of 2025 (which is 50% higher than the capital raised across the entire year of 2024), according to data from Tracxn, a market intelligence platform.

India's main lab-grown diamond manufacturing landscape has expanded significantly in recent years. Leading manufacturers include Greenlab Diamonds (which manufactured the 7.5-carat lab-grown diamond gifted by Prime Minister Modi to Jill Biden), Limelight Lab Grown Diamonds, and Cupid Diamonds, among others. Greenlab is one of India's largest manufacturers, with more than 1,000 reactors using the CVD technology. Another company, Real Illusion, has set up around 80 reactors in Jaipur. In September 2025, Kira Diam, which is one of India's largest lab-grown diamond producers, expanded its production capacity from 2,600 to 4,000 CVD reactors, and has also installed a 25-megawatt solar plant to power its growing operations. At this scale, Kira produces over 250,000 polished carats every month.

According to industry estimates, India presently has between 8,000 and 10,000 CVD reactors operating in the country, although a number of new manufacturers are eyeing the HPTP method as well.

CVD reactors are now more readily available for purchase in India at costs significantly lower than that in 2019, thus lowering the barrier to entry for new manufacturers (added in detail in following sections).



Retail Jewellery Market

Presently, the jewellery segment contributes a mere 2% of India's LGD market. In fact, only 3-4% of Indians purchase diamond jewellery. The main reason for this is the price factor – a gap which lab-grown diamonds are on the verge of filling by making diamond jewellery affordable for all segments of consumers, especially the middle class.

Lab-grown diamonds are making an appearance in Indian jewellery stores as well. This includes jewellery start-ups such as Itara Diamonds (based in Mumbai) and Wondr Diamonds (based in Coimbatore). Fiona Diamonds and Avtaara are also fresh entrants in the fine LGD jewellery market. By 2024, Limelight Lab Grown Diamonds expanded to over 40 exclusive brand outlets nationwide, emerging as the one of the largest dedicated LGD jewellery retailers in India, and also offers its customers resale and buyback opportunities for its lab-grown diamond jewellery.

In 2022, Titan Co. invested USD 20 million in Great Heights, a US-based retailer which sells lab-grown diamonds manufactured by Clean Origin. While Tanishq has historically remained focused on natural diamonds, the Titan Group has now entered the LGD jewellery retail segment through Mia by Tanishq, which operates as a distinct brand targeting younger and price-conscious consumers. More recently, Titan has further expanded its lab-grown diamonds strategy with the launch of a dedicated lab-grown diamond jewellery brand, beYON.

Measures by the Indian Government

The Indian government has identified lab-grown diamonds as an important sector and is focused on making India the new leader in this growth segment.

During the Union Budget 2023-24 speech, Finance Minister Nirmala Sitharaman announced many measures relating to the government's focus on lab-grown diamonds, noting that "LGD is a technology-and innovation-driven emerging sector with high employment potential".

Below is a summary of recent measures by the Indian government to boost the LGD sector:

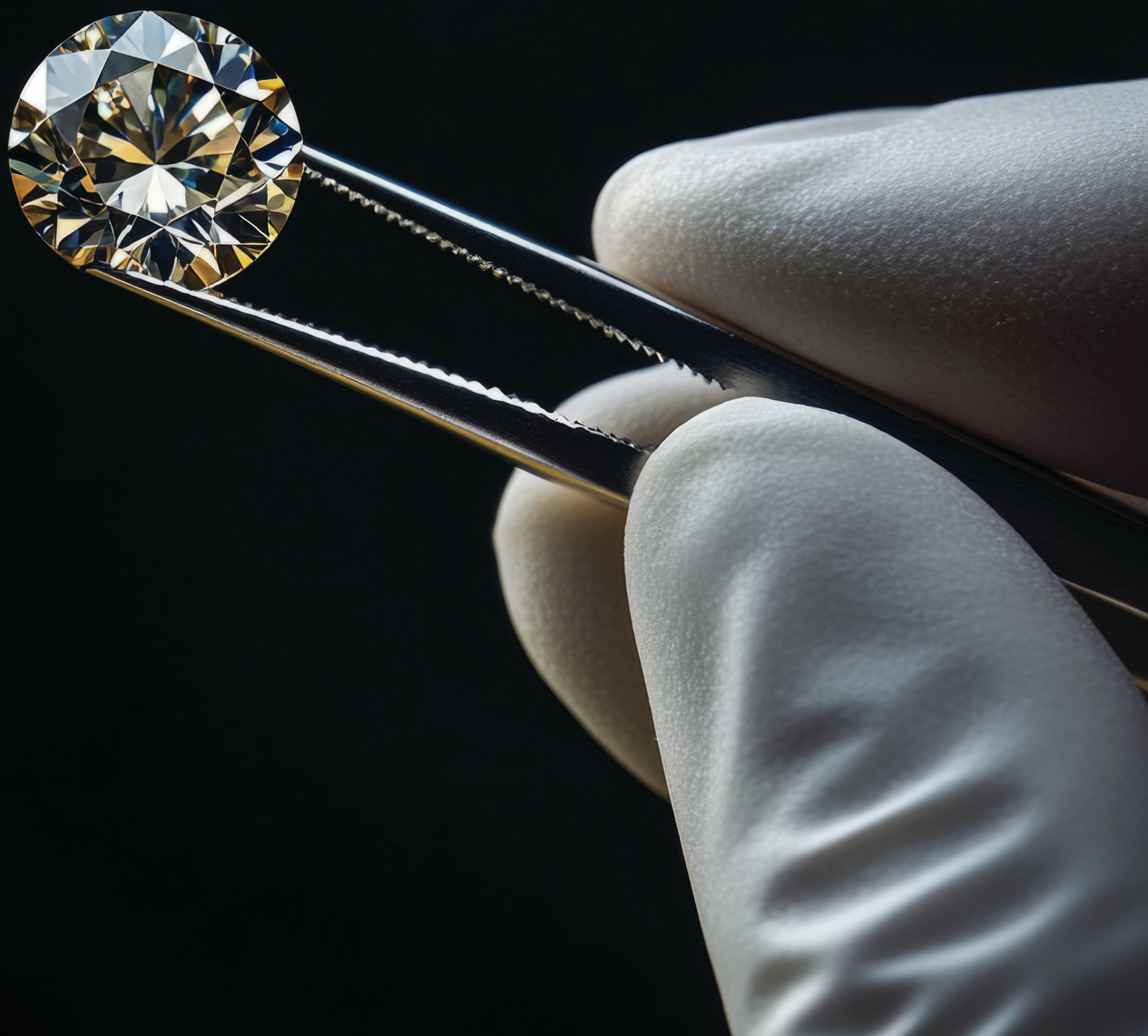
- ◆ The Directorate General of Foreign Trade (DGFT) assigned separate Harmonised System (HS) codes for natural and lab-grown diamonds. This classification distinguishes natural diamonds under HS code 7102 from synthetic or laboratory-grown diamonds under HS code 7104.
- ◆ In 2019, the government announced 100% foreign direct investment (FDI) in the sector under the automatic route.
- ◆ Loose diamonds, including lab-grown diamonds, attract a GST rate of 0.25%, while diamond jewellery is taxed at 3% GST.
- ◆ In the Union Budget 2023-24, the government announced a reduction in customs duty on the import of diamond seeds used in the manufacture of lab-grown diamonds from 5% to 0%. Rough diamonds can also be imported at zero customs duty.

Additionally, the government has also announced a 5-year research grant of INR 242.96 crores to IIT-Madras to encourage the indigenous production of machinery and seeds required for lab-grown diamonds and the technology and recipe to manufacture them.

The PIB release announcing the research grant notes that: *"It is imperative that India develops its own, indigenous technology for producing the critical machinery components seeds to remove the import dependence that we have in the case of natural diamonds. Good quality lab-grown diamonds with qualified certification, produced from the developed equipment and process parameters will attract many foreign customers increasing the export volume of lab-grown diamonds and scalability of production. The documented process parameters and the developed recipe will encourage new entrepreneurs to enter the lab-grown diamond business making it easier and cost-effective to set up the facility, start the business and generate employment."*

In June 2023, the Maharashtra cabinet approved the proposal for the development of the India Gems and Jewellery Park in Navi Mumbai. The park is expected to create one lakh jobs and will have several units that can house lab-grown diamonds. The State Government also approved the Maharashtra Gems and Jewellery Policy (2025-2030), earmarking Rs. 1,651 crores for the first five years, including roughly Rs 100 crore for 2025-26, aimed at supporting polished diamonds (natural and lab-grown), gold, silver, and gemstone clusters.

In recent years also, policy discussions focus on made in India lab-grown diamonds and high-value manufacturing, with an added focus on energy efficiency and sustainability in LGD production.



7. NOT ALL THAT GLITTERS: CHALLENGES AND ROADBLOCKS



In this section, we examine some of the challenges faced by today's lab-grown diamonds industry, both global and from the Indian perspective.

Falling Prices

Depending on the size, colour, and clarity, a lab-grown diamond can be 70-90% less expensive than a natural diamond. In 2015, a 1-carat lab-grown diamond was priced only 20% less than a natural mined diamond. By 2025, the differential had widened to as much as 76% (see above section for detailed price comparison).

The lab-grown diamond industry has seen almost 10 years of price declines, and especially sharp decline over the past few years. By 2023, industry experts and lab-grown diamond manufacturers had anticipated the decline in the prices of lab-grown diamonds, considering factors such as rapid ramping up of production and the possibility of supply exceeding demand. During 2024 and 2025, the market experienced a significant inventory correction owing to large-scale manufacturing in India and China as well as the weaker demand in the US and Chinese markets. This resulted in a sharper decline in the wholesale prices of lab-grown diamond, with prices declining almost 90-95% in some cases as compared to 2019 price levels. Retail prices also adjusted downward as inventories were cleared.

The prices may stabilise at some point as the market diverges from that of natural mined diamonds, and more regulations and quality controls are introduced in this sector (discussed in detail below).

Sustainability

As outlined in the previous sections, lab-grown diamonds have been marketed as eco-friendly and sustainable, but they are not free of a carbon footprint. There is potential for using 100% renewable energy for manufacturing diamonds. However, this technology is expensive and has not been widely implemented yet.

There is significant potential for producing lab-grown diamonds using 100% renewable energy, which could substantially reduce their carbon emissions. However, the adoption of renewable energy-based production remains limited, especially in major manufacturing hubs such as India and China, where electricity grids continue to rely heavily on fossil fuels.

High Set-up Costs

The lab-grown diamond industry is capital-intensive because it requires the import of reactors and CVD machines at a high cost. It also requires a substantial investment in specialised equipment along with the import of high-quality diamond seeds without any impurities, a patented recipe for manufacturing, and high research and development costs. The sale of lab-grown diamonds also depends on the marketing spend of the company.

In India, lab-grown diamond manufacturers import many critical components such as microwave plasma CVD reactors or using HPHT machines, vacuum pumps and sensors, and good-quality diamond seeds. Entry-level microwave plasma CVD reactors can typically cost between approximately USD 80,000 and USD 200,000, while larger industrial systems can cost several hundred thousand dollars depending on capacity and configuration. According to industry estimates, the cost of CVD reactors has fallen significantly over the past few years – for example, the cost of a CVD reactor in 2019 was between USD 250,000 to USD 300,000 per reactor. According to a report commissioned by the Antwerp-based World Diamond Centre, in ten years, the cost to manufacture a CVD lab-grown diamond fell more than tenfold – from USD 4,000 per carat in 2008 to between USD 300 and USD 500 per carat by 2018. This is largely due to technological improvements, domestic manufacturing of equipment, and increased competition among suppliers.

The estimated purchase cost of lab-grown diamond equipment in India using CVD or the HPHT method is as below:

Method	Equipment Type	Purchase cost in India
CVD	Entry-level / small scale reactor	USD 80,000 -150,000
	Standard Industrial reactor	USD 150,000 -300,000
HPHT		USD 200,000 -400,000

A downside of the falling production costs is that this lowers the barriers to entry for standard quality lab-grown diamonds, thus increasing competition across the industry.

Technology & Human resources for R&D

The lab-grown diamond manufacturing sector requires specific precision equipment. India is a leading manufacturer of diamonds using CVD technology, although The use of HPHT methodology is also on the rise.

Another challenge for the industry is the availability of research teams and scientists. High-level research is required to produce diamonds which are gem-quality but also for diamonds that are used in electronic applications such as 5G/6G, magnetometry, thermal management, sensors and quantum technologies. Even while most of the machines, especially HPHT machines, are imported in India, the reactor manufacturers do not provide the recipes to realise single-crystal diamonds. With the research grant given to (see below), the government hopes to indigenously develop the research technology and components for the reactors and the diamond substrates, thereby reducing its import dependence for growing high-quality diamonds.

Banking Restrictions

Financing conditions across the lab-grown diamond industry also reflect caution by banks and lenders regarding extending credit to a sector that has been characterized by declining prices, rapid technological growth, increasing inventory risks and economic volatility. From the Indian perspective, following the 2018 Punjab National Bank fraud case involving Nirav Modi, many banks clammed up on lending to the diamond sector. In August 2022, the State of Bank of India (SBI) became the first Indian bank to frame a policy to fund lab-grown diamond manufacturers, signalling a welcome change in lending sentiment regarding the sector. In 2023, Punjab National Bank itself followed suit and framed a new internal policy to bankroll lab-grown diamond manufacturers. Banks are now extending credit to lab-grown diamond manufacturers with stricter safeguards, requiring 25-30% collateral coverage (sometimes close to 100%). In the case of small-scale diamantaires in Surat seeking credit, banks are increasingly capping exposure based on confirmed orders turnover cycles instead of relying on inventories alone.

In addition, we explore below the specific risks faced by the lab-grown diamond industry depending on the end use of the diamond, i.e., for jewellery segment or industrial use:

Jewellery Segment

Selecting Buying and Consumer Trust

Buyers are increasingly shifting to selective purchasing within the lab diamond jewellery segment. Increasing inventories and higher supply than demand within the sector provides a very wide range of options to buyers, resulting in a change in buyer sentiment and consumer behaviour. Customers are now increasingly prioritising certified diamonds or demanding niche categories (for e.g., the elongated fancy shape). This reduces the incentive for sellers to hold inventory, transitioning the market into a just-in-time inventory model.

Additionally, variations in diamond production methods and inconsistent grading standards can cause quality differences, leading to brand differentiation and potential dilution in consumer trust. There is a need for reliable grading (e.g., IGI, GIA certification) and clear disclosure of origin and post-growth treatments.

Risk of Commoditisation and Demand Dilution

With lab-grown diamonds become significantly cheaper than their natural diamond counterparts, there is a shift in consumer attitudes toward diamonds in general. With buyers often willing to choose a lab-grown diamond to get a larger or higher-quality stone for the same budget, diamonds themselves have lost some of their appeal. A 2024 report by McKinsey & Company highlights that the diamond industry is at a structural inflection point and outlines a scenario where lab-grown diamonds become a mass-market product, while natural diamonds reposition as niche luxury goods.

Industrial Use Segment

Commercial Scalability of Technological Applications

While lab-grown diamonds are increasingly being used in many technological and electronic applications, the commercial scalability of such applications remains slow. Lab diamonds have high value use cases such as semiconductors and quantum systems, however, there are challenges such as scalability, technical issues, and high costs. Silicon is still largely being used in semiconductors, and while diamond may never replace silicon entirely, it may accelerate the development of high power electronics.

Additionally, lab diamonds are still competing with alternative materials which already have established uses in the industrial sector, for example, silicon carbide (SiC) and gallium nitride (GaN) in power electronics, or copper, aluminium, and advanced composites in thermal management. Since these alternative materials already have an integrated supply chain with stable prices, diamonds need to demonstrate a performance-to-cost advantage in order to have commercial use.

Standardisation Barriers

For high-tech applications, lab-grown diamonds need to meet very strict certification and quality standards, which require high capital expenditure and infrastructure. Small-scale manufacturers also face technological obsolescence with rapid advancements in the sector, particularly to realise industrial-quality single crystal diamonds.



8. THE NEXT CUT: WHAT LIES AHEAD



Predictions for the Lab-Grown Diamond Industry

The lab-grown diamond industry is expected to continue expanding despite price pressures, reflecting strong consumer adoption and increasing applications beyond jewellery, including in electronics, optics, and advanced materials. At the same time, the entire diamond industry is in a state of flux. The outlook for the natural diamond industry is closely linked to structural shifts such as the upcoming divestment of De Beers by its parent company, Anglo American, as part of a broader restructuring strategy. As of early 2026, a structured sale process is actively underway, with diamond-producing nations such as Botswana (already a 15% stakeholder) and Angola showing a strategic interest in buying or increasing their stakes as part of a consortium. The restructuring and eventual sale of De Beers is one of the most significant events that will shape the future of the natural diamonds market.

As regards lab-grown diamonds, the prices have been declining for almost 10 years, with especially sharp declines in the past few years. However, according to Edahn Golan's Lab Diamond Wholesale Price List, the rate of price decline has slowed significantly, with wholesale prices declining 26% year-on-year in 2025, but quarterly price drops narrowing to just 4.7% in late 2025 - the smallest decline since lab-grown diamonds became commercially widespread. Edahn Golan also predicts that with ramped-up HPHT production, the price of smaller stones is likely to keep increasing and may result in a levelling off in the prices of larger stones.

We can conclude from the above estimates that lab-grown diamond prices are approaching production cost floors, and unless there are major technological breakthroughs, the market may be close to reaching a price equilibrium, i.e. a price stabilisation at lower levels.

Against this background, industry experts outline three possible outcomes for the future of the diamond sector:

Scenario 1: Market Bifurcation | Most likely outcome

In this scenario, lab-grown diamonds position themselves in the market primarily as a technology-driven and accessible alternative to natural diamonds rather than a scarcity-based luxury product. In the jewellery segment, lab-grown diamonds are not competing with natural diamonds and become affordable, highly commoditized fashion accessories. This outcome, which is the most likely outcome for the diamond industry in the future, would split the market into two distinct segments with diverging prices that co-exist and cater towards separate end-use applications.

Scenario 2: Market skews towards lab-grown diamonds | Moderately likely outcome

In this scenario, lab-grown diamonds become the norm, replacing natural diamonds across the jewellery and industrial segments. Natural diamonds retain a niche in the high-end luxury market, whereas lab-grown diamonds dominate by volume while also retaining their price advantage. This outcome would likely result in the price of natural diamonds skyrocketing, and would negatively affect the diamond mining industry, but with lab-grown diamonds retaining their affordability and appeal.

Scenario 3: Dilution of lab-grown diamonds demand: Least likely outcome

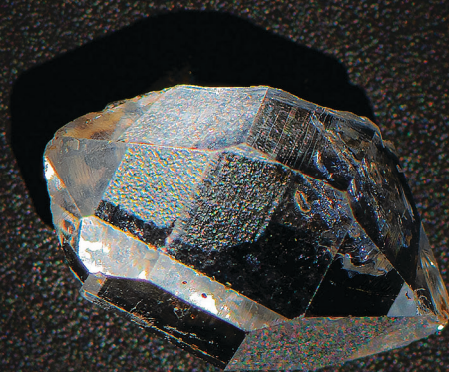
In this least likely yet high-risk scenario, diamonds in general lose their appeal, and thereby drag down the demand across natural as well as lab-grown diamonds segments. This may happen if consumers are no longer able to differentiate between natural and lab-grown diamonds, particularly in the jewellery and engagement rings sectors. This outcome is the least likely, and yet the most at-risk outcome for the natural diamond and the lab-grown diamond industry both.

Conclusion

On a global scale, the impending structural shifts within the diamond industry will determine the course of the lab-grown diamonds sector. However, as lab-grown diamonds move into a sector with far more significant implications than simply being a cheaper alternative to natural diamonds, the industry's appeal in both the jewellery and industrial segments is only going to increase, possibly spurring a new technological revolution.

India is the world's largest cutting and polishing hub, processing an estimated 90% of global diamonds by volume, however, a majority of these are imports of rough stones that are then exported after processing, thereby yielding value addition (around 2-5%). On the other hand, with lab-grown diamonds, since production and processing is all undertaken domestically, the value addition is significantly higher. The entry of lab-grown diamonds will reduce India's dependence on imports of rough diamonds as well as on machines, diamond seeds and technology, while also moving the industry up the value chain toward technology-led manufacturing and branded retail. Already, cutting and polishing units in Surat and Jaipur are converting their set-up to lab-grown diamonds. Surat is also emerging as a key hub for lab-grown diamond manufacturing, using both CVD and HPHT methods. Additionally, Indian manufacturers and diamond processing units are increasingly deploying advanced technologies such as AI-based grading, automated optical scanning and mapping, quality assessment systems, and computer-aided cutting and planning software. For example, Sarine's AI-driven grading and planning systems enable manufacturers to create 3-D digital models of diamonds, optimize cutting yields, and automatically assess colour, clarity, and other characteristics with greater speed and consistency.

The new sector will open up a new class of consumers – namely, the women and middle-class population who can afford a lab-grown diamond. The sector will also create employment opportunities, technological research and innovation and increase the demand for high-quality, affordable, made-in-India diamonds. The grant awarded to IIT-Madras, India, to develop indigenous seed and reactor technology represents a pivotal shift for the country. The outcomes of this research will improve India's technological capability, thereby reducing import dependence and enhancing margins across the diamond value chain. India's chairmanship of the Kimberley Process also presents a significant diplomatic opportunity to influence global standards on disclosure, traceability, and certification, thereby helping build greater transparency and consumer trust across markets. Leveraging these opportunities will help position India not only to become a global leader but also to shape the future of the global diamond industry.



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