

# Diamond *Facts*

ADDRESSING MYTHS AND MISCONCEPTIONS  
ABOUT THE DIAMOND INDUSTRY

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# Foreword

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**“The diamond industry continues to go from strength to strength.**

Yet, myths surrounding the industry’s operations, its standards and its players continue to perpetuate. This is, in part, a result of a historical legacy that has not yet been fully corrected, despite the transformation and reform which has occurred over recent decades. These myths and misconceptions erode trust, and, in the long run, they can be harmful, not only to the diamond industry but especially to those who most depend on the positive impact of diamonds such as the communities where diamonds come from.

In an age where consumers are more inquisitive and enlightened than ever, they wish to know about the values and responsible business practices from the companies and indeed the wider industry from which they are purchasing. At the Natural Diamond Council (NDC), we want to support consumers in taking informed decisions by providing information transparently.

The modern diamond industry is not perfect, and of course has challenges and areas of improvement. Our strength is the unity with which we address opportunities and challenges. The diamond industry supports the livelihoods of 10 million people across the world, helping to provide better access to healthcare, education, infrastructure, as well as scale and access to funding to contribute to solving some of the world’s biggest challenges. The industry is also pursuing land protection and rehabilitation across continents with fervor.

With this analysis, we seek to correct misconceptions and answer questions about the industry to enhance trust and allow consumers to make informed decisions.

As the landscape evolves, we will endeavor to continue to fill data gaps, engage in feedback and collaborations that can better the industry and enhance transparency.

We thank you for taking the time to read the report.”

DAVID KELLIE – CEO, NATURAL DIAMOND COUNCIL

# Introduction

In recent years, the jewelry industry has evolved with the advent of laboratory-grown diamonds as a new category. An abundance of misconceptions, myths and unsubstantiated claims have entered the information sphere.

In this analysis, we set out to address misinformation about both natural diamonds and laboratory-grown diamonds.

The intent is not to present this as a dichotomy, or position as one better than the other, but instead to share the realities and conditions upon which laboratory-grown diamonds and natural diamonds are created. Equally, our focus is on providing, clear, accurate and reliable information so consumers can make informed choices. As detailed in the research, the reader can use existing information to formulate their own opinions.

Misinformation is harmful for all stakeholders in the diamond value chain whether that is the consumer, mining companies, investors or local communities involved in regions which rely on the production of diamonds for economic stability.

We are dedicated to creating a positive legacy for all these stakeholders through openness and unbiased research.

Our work details an investigation into questions often posed relating to environmental and social standards, alongside general misconceptions about the market like quantity of diamonds recovered.

We redress the claims that it is impossible to distinguish between a laboratory-grown diamond and a natural diamond, explore how consumers can navigate this when buying diamonds and detail how global regulations are in place to protect purchasing decisions along the supply chain.

On the environment, we delve into the nuances of sustainability claims made by the laboratory-grown diamond industry. Alongside reviewing impacts on water, waste and chemicals, the emissions footprint of both natural and synthetic diamonds is reviewed, and the process of responsible opening and closure of mines is detailed.

Outdated and misleading narratives about social conditions in the natural diamond industry are also evaluated. We explore ethical sourcing of natural diamonds, the heightened focus on transparency and adoption of technology to enhance traceability. The robust set of measures in place to enshrine the rights of the employees of Natural Diamond Council (NDC) members is included. Through spotlighting initiatives and social programs, we seek to communicate the positive impact it has on the livelihoods of 10 million people, especially from the diamond producing countries.

By tackling outdated and factually incorrect narratives, we are able to collaborate with all stakeholders to better communicate the inherent value and benefit of natural diamonds, as well as ensure clear and accurate information is shared about the industry in order to build trust and cultivate transparency. This is married to our mission at the Natural Diamond Council.

**Learn more at:**

**[www.naturaldiamonds.com/diamondfacts/](http://www.naturaldiamonds.com/diamondfacts/)**

## A NOTE ON RESEARCH METHODOLOGY

*The findings of this analysis have been derived from a thorough review of a wide range of secondary research sources and the evaluation of internal research conducted on behalf of the Natural Diamond Council by globally respected third-party organizations.*

Industry experts and independent sustainability advisors were consulted on the topics included in the work to inform the findings. Research was conducted at the beginning of 2023. Methodologies for calculations pertaining to environmental footprints have been detailed in the footnotes and where industry data gaps or inconsistencies exist, a range has been used to provide balance. We welcome increased levels of disclosure across the industry for both natural and synthetic diamonds to enrich and inform future research.

## Key *Findings*

# Is it possible to tell a *laboratory-grown* diamond from a *natural* diamond?

## FACTCHECK:

All laboratory-grown diamonds can be detected using professional verification instruments. These tools use a variety of technologies to detect the differing growth patterns between natural diamonds that are formed over billions of years in the Earth, and synthetic diamonds that are produced across a number of weeks in a manufacturing environment.

Claims that it is impossible to distinguish between a synthetic, laboratory-grown diamond and a natural diamond are false. Since diamond crystals grow differently in nature from in a laboratory, their grain patterns, like those in wood, are different<sup>1</sup>.

Consumers want to be sure about what they are buying, and there are many instruments available to distinguish between natural and synthetic diamonds. There are also legal definitions, advertising guidelines and certifications to ensure that consumers are correctly informed. These are explored in the following chapter.

Industry professionals have, for many years, used specialist laboratory equipment to examine growth patterns, composition, nitrogen content, fluorescence and spectral signature to identify whether it grew in the Earth's mantle or if it was manufactured in a factory.

For example, production of colorless laboratory-grown diamonds requires almost the complete removal of nitrogen, a constituent of around 99% of natural diamonds<sup>2</sup>.

The changes to impurities in natural diamonds produced by extended times under the Earth can lead to very different responses to ultraviolet light.

These studies have been applied to the development of screening and detection instruments that can be used to reliably detect all laboratory-grown diamonds<sup>3</sup>.

With the increased quantity of laboratory-grown diamonds on the market, it has become increasingly important to address this misconception to protect consumers and purchasers across the supply chain, and ensure they understand the product they are buying, which is accompanied by the correct claims about its origin.



CVD LABORATORY-GROWN DIAMONDS

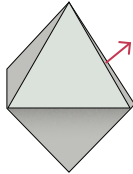
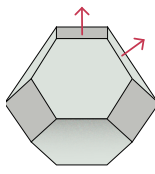
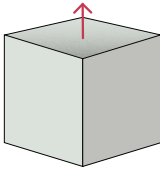


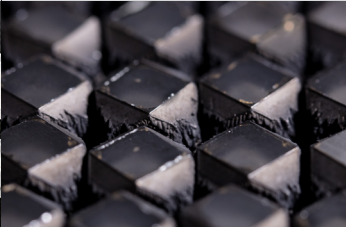
<sup>1</sup>GIA (n.d.) Synthetic Diamonds: Improved Quality and Identification Challenges. Available at: <https://www.gia.edu/gia-news-research-improved-quality-identification-challenges>

<sup>2</sup>GIA (2017) A synthetic diamond overgrowth on a natural diamond. Available at: <https://www.gia.edu/gems-gemology/summer-2017-labnotes-synthetic-diamond-overgrowth-natural-diamond>

<sup>3</sup>GIA (2019) Diamonds from the deep: How old are diamonds? Are they forever? Available at: <https://www.gia.edu/gems-gemology/spring-2019-how-old-are-diamonds-are-they-forever>

Differences which exist between natural and laboratory-grown diamonds are due to their differing creation processes. Natural diamonds were formed between 90 million and 3 billion years ago<sup>4</sup> by the action of high pressures and temperatures on carbon that took place approximately 100 miles below the Earth's surface. They were subsequently brought to the surface by dramatic volcanic eruptions. Laboratory-grown diamonds are mostly produced in a number of weeks using one of two technologies.

The High Pressure High Temperature (HPHT) method emulates the Earth's method of diamond creation by using very high temperatures (1300-1600°C) and high pressures. Alternatively, the Carbon Vapor Deposition (CVD) method produces a diamond crystal from a seed diamond plate by placing it in a hot gas chamber (900-1200°C) with methane and hydrogen. The table below provides more detail about the differences in the creation processes and resultant rough and raw diamond shapes.

	NATURAL DIAMONDS	LABORATORY GROWN DIAMONDS HIGH PRESSURE HIGH TEMPERATURE (HPHT) METHOD	LABORATORY-GROWN DIAMONDS VIA CARBON VAPOR DEPOSITION (CVD) METHOD
CREATION PROCESS	Originated millions, sometimes billions of years ago when carbon crystallized over 100 miles beneath the Earth's surface, under conditions of intense heat and pressure. Diamonds remained unaltered for millions of years until 25 - 400 million years ago, when a number underwent a dramatic process where they were propelled upwards by volcanic rock called kimberlite. They travelled through the Earth's mantle and crust to its surface during violent volcanic explosions. Some continued their journey to be found on riverbeds or the sea where they reside on ocean floors. The majority remain in solidified lava rock.	This HPHT method replicates part of the Earth's process of forming natural diamonds. Graphite is placed in a large machine with metal solvent. It is then placed in a press with a molten flux of metals like iron, nickel or cobalt where it is crushed to extreme pressures and heated to high temperatures (pressure around 870,000 pounds per square inch <sup>5</sup> , and temperatures of 1300-1600 °C). According to the GIA, this pressure is roughly equivalent to the pressure exerted by a commercial jet airplane if balanced on the tip of a person's finger <sup>7</sup> . Under these conditions and with careful control, the carbon material then migrates through the flux to the cooler diamond seed and crystallizes over a period of days or weeks to form a synthetic diamond crystal. Following conversations with industry professionals, we learnt that each HPHT reactor can weigh around 50 tonnes.	Carbon Vapor Deposition (CVD) uses a diamond plate as a seed crystal. This is placed into a chamber, which is then filled with gases (methane and hydrogen) and heated to extreme temperatures of around 900-1200°C and carbon atoms from the break-up of methane are deposited as layers onto the seed crystal, eventually producing a diamond crystal. The resultant synthetic diamonds tend to be square-shaped or tabular. The layered growth is responsible for generating one of the key identification features of CVD synthetic diamonds as their fluorescence emission shows streaked and lined patterns related to the growth <sup>8</sup> .
TYPICAL SHAPE	 <p>SHAPE: Octahedron</p> <p>GROWTH: 8 directions</p>	 <p>SHAPE: Cuboctahedron</p> <p>GROWTH: 14 directions</p>	 <p>SHAPE: Cube</p> <p>GROWTH: 1 direction</p>
ROUGH NATURAL DIAMONDS AND RAW LABORATORY- GROWN DIAMONDS			

<sup>4</sup>GIA *Diamonds from the Deep: How Old Are Diamonds? Are They Forever?* (2019) <https://www.gia.edu/gems-gemology/spring-2019-how-old-are-diamonds-are-they-forever>

<sup>5</sup> *Gemological Science International* (2021) <https://gemscience.net/geological-origin-of-natural-diamonds/>

<sup>6</sup>GIA: *HPHT and CVD Diamond Growth Processes* (2016) <https://www.gia.edu/hpht-and-cvd-diamond-growth-processes>

<sup>7</sup>GIA: *Observations on HPHT-grown synthetic diamonds: A review* (2017) <https://www.gia.edu/gems-gemology/fall-2017-observations-hpht-grown-synthetic-diamonds>

<sup>8</sup>GIA (2019) *CVD Layer grown on natural diamond*. Available at: <https://www.gia.edu/gems-gemology/spring-2019-labnotes-cvd-layer-grown-on-natural-diamond>

	NATURAL DIAMONDS	LABORATORY GROWN DIAMONDS HIGH PRESSURE HIGH TEMPERATURE (HPHT) METHOD	LABORATORY-GROWN DIAMONDS VIA CARBON VAPOR DEPOSITION (CVD) METHOD
REGIONS OF ORIGIN	The conditions needed for the growth of diamonds within the Earth are only found in certain regions. These diamonds must then survive transport through the Earth's crust in order to be recovered. Natural diamonds are only found in a limited number of places including Botswana, Canada, Russia, Australia, Angola, South Africa, Namibia, Zimbabwe, Lesotho, Democratic Republic of Congo (DRC) <sup>9</sup> .	In theory, HPHT laboratory-grown diamonds can be created anywhere. In practice they are mostly produced in China, Singapore, Russia and the US <sup>10</sup> .	In theory, CVD laboratory-grown diamonds can be created anywhere. In practice they are mostly produced in India, the US, Singapore, Europe, the Middle East, China and Russia <sup>11</sup> .
INCLUSIONS (IF PRESENT)	Inclusions refer to any 'birthmarks' in the stones which can either be related to structural defects in the crystal lattice or to small pieces of other minerals which were trapped inside the diamonds as they crystallized <sup>12</sup> . These inclusions can give scientists important clues about the history of the earth <sup>13</sup> .	Metallic flux inclusions containing iron, nickel or cobalt are caused when the metals used as catalysts enter the diamond crystal. These typically appear black and opaque in transmitted light but have a metallic luster in reflected light. Synthetic diamonds with larger inclusions can sometimes be picked up with magnets <sup>14</sup> .	Dark graphite inclusions can form when non-diamond carbon disturbs the growth process <sup>15</sup> .
CREATION TIME	Millions – billions of years	A few weeks	A few weeks

## What *tools* are used to detect synthetic and natural diamonds?

The structural differences between laboratory-grown and natural diamonds may not always be visible to the naked eye. However, there are more than 40 instruments available on the market which can help those involved in the diamond supply chain like retailers, designers and manufacturers detect the difference.

According to the GIA, the instruments help professionals read a diamond's spectral signature to determine its composition and identify whether they originated in nature or from a laboratory. Researchers are trained to check for graining patterns and ultraviolet fluorescence reactions, specific to laboratory-grown diamonds, but in recent years changes in the quality and growth of CVD synthetic diamonds has led to greater dependence on spectroscopic identification techniques alongside the more traditional approaches<sup>16</sup>.

## Further industry assurance

Diamond Verification Instruments are an integral part of the procedures that ensure pipeline integrity, preventing the mixing of synthetic diamonds and natural diamonds.

The Natural Diamond Council established the ASSURE program in 2019. It assesses the relative performance of Diamond Verification Instruments available on the market. Industry professionals can use the Directory to guide them in choosing the instrument that will best serve their needs<sup>17</sup>.

*Certification and legal guidelines on diamond definitions also help guide customers and stakeholders across the supply chain about whether they are buying laboratory-grown or natural diamonds. Read on to find out more.*

<sup>9</sup>Kimberley Process Statistics (n.d.) Public statistics. Available at: [https://kimberleyprocessstatistics.org/public\\_statistics](https://kimberleyprocessstatistics.org/public_statistics)

<sup>10</sup>Bain & Company (2021) The global diamond industry 2020 – 2021. Available at: [https://www.bain.com/globalassets/noindex/2021/bain\\_report\\_diamond\\_report-2020-21.pdf](https://www.bain.com/globalassets/noindex/2021/bain_report_diamond_report-2020-21.pdf)

<sup>11</sup>Ibid.

<sup>12</sup>IGI (2020) Some clarity on diamond clarity. Available at: <https://www.igi.org/gemblog/some-clarity-on-diamond-clarity>

<sup>13</sup>GIA (2014) Tiny inclusions reveal diamond age and earth's history. Available at: <https://www.gia.edu/UK-EN/gia-news-research-tiny-inclusions-reveal-diamond-age>

<sup>14</sup>IGI (2023) Inclusions seen in Lab grown diamonds. Available at: <https://www.igi.org/gemblog/inclusions-seen-in-lab-grown-diamonds/>

<sup>15</sup>Ibid.

<sup>16</sup>GIA (n.d.) Synthetic diamonds: Improved quality and identification challenges. Available at: <https://www.gia.edu/gia-news-research-improved-quality-identification-challenges>

<sup>17</sup>Natural Diamond Council (n.d.) ASSURE Program. Available at: <https://www.naturaldiamonds.com/assure>

# How do I know *whether I'm purchasing* a natural or a laboratory-grown diamond?

## FACTCHECK:

Legal definitions and advertising guidelines exist to protect and reassure consumers about whether they are purchasing a natural or laboratory-grown diamond. Retailers obtain specific grading reports or certifications from independent organizations that can verify the origins and quality of natural and synthetic diamonds.

## Legal Definitions and Advertising Guidelines

Clear diamond terminology exists to guide audiences on what can and cannot be classified as a diamond, as well as how to refer to laboratory-grown diamonds<sup>18</sup>.

Across the world, there are now global standards and national legislative requirements which must be followed by anyone selling these stones.

*Key points from the standards are:*

- The word diamond used on its own always implies a natural diamond.
- Just three terms can be used to describe synthetic diamonds: 'synthetic diamonds', 'laboratory-grown diamonds' and 'laboratory-created diamonds'. Terms that include the manufacturer's name, followed by the word created are also permitted in the United States of America.

Table 1 - Summary of definitions and guidelines

USA	In 2018 the US Federal Trade Commission (FTC) released new guidelines for the Jewelry, Precious Metals, and Pewter Industries warned against the use of terms like 'natural, real, genuine and precious'(which can be used for natural diamonds from the Earth), in the marketing of laboratory-grown diamonds to prevent confusion between two distinct categories <sup>19</sup> . Three modifiers were approved by the FTC for the description of laboratory-grown diamonds: 'laboratory-grown', 'laboratory-created', or (manufacturer's name) created. 'Synthetic' can also be used. Man-made, cultured, and above-ground are not acceptable modifiers for laboratory-grown diamonds. Abbreviations such as 'lab-grown diamonds' are not accepted. When used alone, the word 'diamond' alone always means a natural diamond.	FRANCE	The decree n°2002-65 includes guarantees to protect the consumer about the terminology that can be used in the trade of gemstones and pearls. As the French government deemed that there is no acceptable local translation of the English terms "laboratory-grown" or "laboratory created", then only the use of the term "synthetic" is authorized.
		ISO INTERNATIONAL ORGANIZATION FOR STANDARDIZATION	The ISO 18323:2015 standard on consumer confidence in the diamond industry provides global guidelines and clearly defines terminology to be applied, including three accepted modifiers: synthetic diamonds, laboratory-grown and laboratory created diamonds <sup>21</sup> .
UK	The Advertising Standards Authority (ASA) has used terminology guidance developed by the National Association of Jewellers (NAJ) and other leading industry organizations to rule that diamond advertising must ensure that the correct identifier and term is used for diamond products to make the nature of its origin clear <sup>20</sup> . In the UK market, these guidelines have the status of Primary Authority Advice which is assured and recognized by Trading Standards.	CIBJO (THE WORLD JEWELLERY CONFEDERATION) DIAMOND BLUE BOOK	Created by the World Jewellery Confederation in consensus with global trade, the Diamond Blue Book records trade practices and nomenclature for the diamond industry throughout the world <sup>22</sup> . The guidance is aligned with the ISO 18323:2015, and complements existing fair trade legislation of a nation or in the absence of relevant national laws they can be considered as trading standards.

<sup>18</sup> Natural Diamond Council (n.d.) Diamond terminology. Available at: <https://www.naturaldiamonds.com/resources/diamond-terminology/>

<sup>19</sup> JVC Legal (n.d.) Understanding the FTC Guidelines. Available at: <https://jvclegal.org/understanding-the-ftc-guidelines/>

<sup>20</sup> Professional Jewellery (2021) ASA rules jewellers must provide clarity on diamond origins. Available at: <https://www.professionaljeweller.com/jewellers-must-provide-clarity-over-diamond-origins-rules-asa/>

<sup>21</sup> ISO (n.d.) ISO 18323:2015 - Jewellery - Consumer confidence in the diamond industry. Available at: <https://www.iso.org/standard/62163.html>

<sup>22</sup> CIBJO (n.d.) The blue books. Available at: <https://www.cibjo.org/the-blue-books/>

Understanding grading reports and certifications

Consumers can also be assured about the identity of their diamond by asking for grading reports or certifications (depending on the grading laboratory).

Laboratory-grown diamonds reports must always disclose in a clear way that they are laboratory-grown. For example, the GIA laboratory-grown

diamond report<sup>23</sup> provides information as to whether it was made via CVD or HPHT. Instead of using terms like ‘VS2’ to accurately grade clarity, or ‘D’ to define color, as used for natural diamonds, GIA identify color and clarity with descriptive terms<sup>24</sup>. Excerpts from sample reports issued by the GIA highlight the differences.

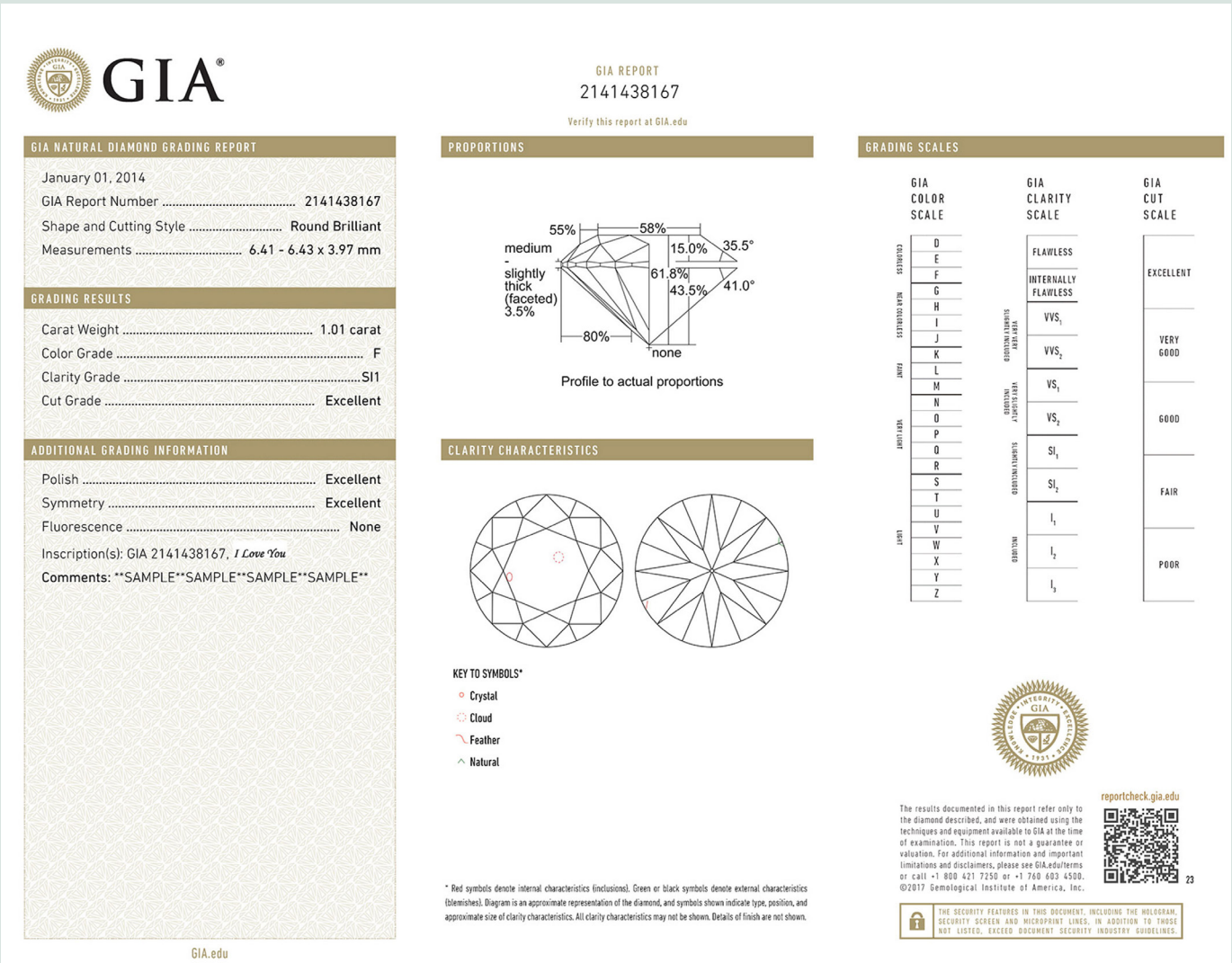


Figure 2 - Sample of GIA Natural Diamond report<sup>25</sup>

<sup>23</sup>GIA (n.d.) Natural diamond grading sample report. Available at: <https://www.gia.edu/analysis-grading-sample-report-diamond>

<sup>24</sup>GIA (n.d.) Grading sample report – Laboratory-grown diamond. Available at: <https://www.gia.edu/analysis-grading-sample-report-laboratory-grown-diamond?reporttype=laboratory-grown-colored-diamond-report>

<sup>25</sup>GIA (n.d.) Natural diamond grading sample report. Available at: <https://www.gia.edu/analysis-grading-sample-report-diamond>



## Understanding *environmental* terms

Before diving into the questions about sustainability and environmental impact, take a look at these concepts.

### **CARBON FOOTPRINT:** EXPLAINED

The quantity of greenhouse gas emissions expressed in terms of carbon dioxide equivalent (CO<sub>2</sub>e), emitted into the atmosphere by an individual, organization, process, product or event from within a specified boundary. The word equivalent is used in the metric as other greenhouse gases besides carbon dioxide, such as methane, are also released into the atmosphere but they are incorporated to create one standard figure for comparison and tracking over time.

### **CARBON INTENSITY:** EXPLAINED

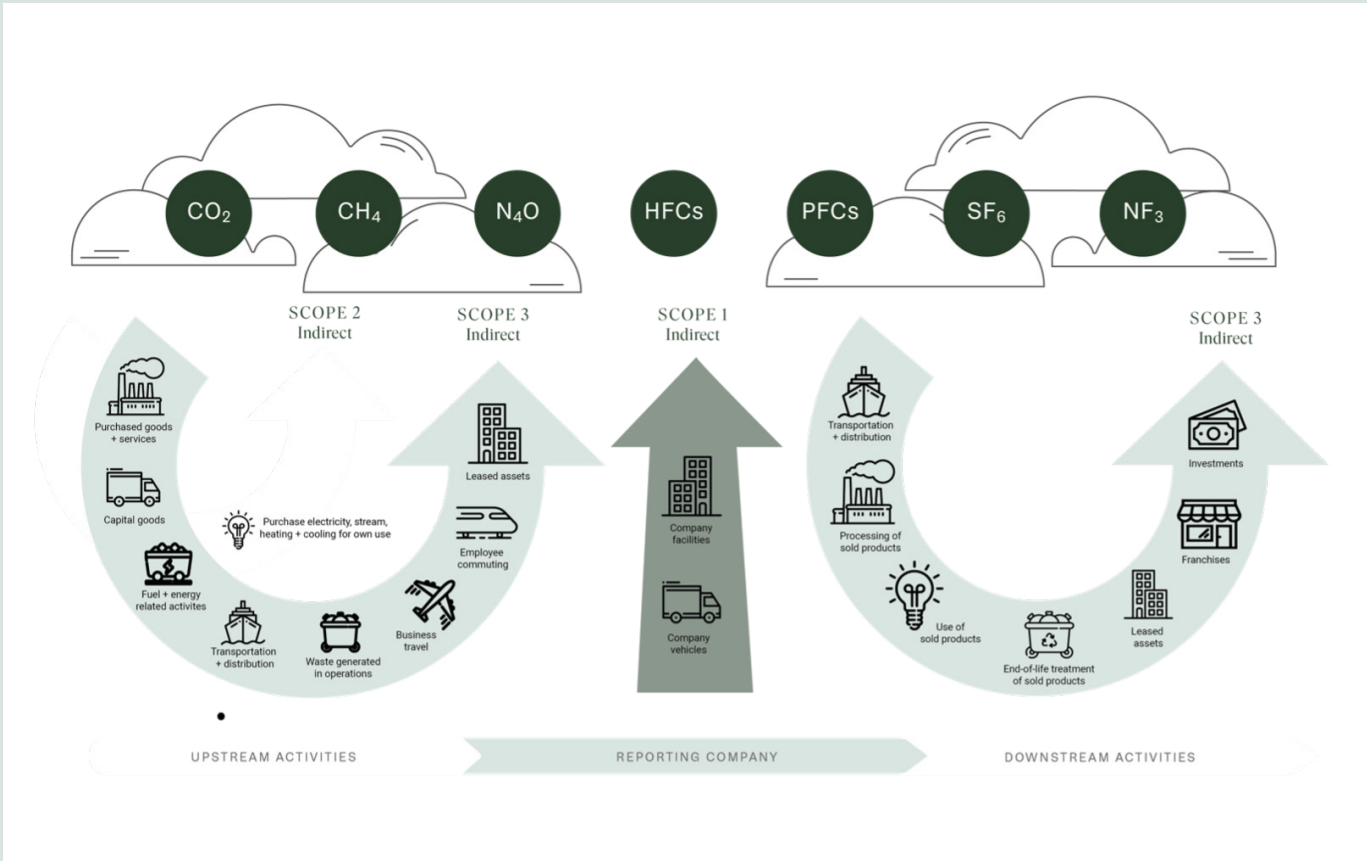
A measure of the carbon footprint (in terms of carbon dioxide and other greenhouse gases emissions) per unit of activity. For diamonds, carbon intensity is typically calculated by totaling the greenhouse gas emissions over a period from a laboratory or mine and dividing this by a measure of production in that period. This is usually either rough or polished carats.



# OVERVIEW OF SCOPES AND EMISSIONS ACROSS THE VALUE CHAIN

The emissions accrued can be separated into three overarching types; **Scope 1**, **Scope 2** and **Scope 3** emissions<sup>27 28</sup>.

Table 1 - Summary of definitions and guidelines



CREDIT: GHG PROTOCOL

## SCOPE 1

Scope 1 predominantly covers fuel-based activities.

It covers emissions from sources that an organization owns or controls directly.

## SCOPE 2

Scope 2 encompasses emissions that are caused through purchased electricity. This could include emissions from electricity generation through to power generators used for buildings and the infrastructure surrounding a given mine.

## SCOPE 3

Scope 3 includes emissions that are not produced by the company itself but are a result of indirect activities owned by different stakeholders in upstream and downstream of the supply chain, like suppliers and transport facilitators.

<sup>27</sup>Carbon Trust (n.d.) What are Scope 3 emissions? Available at: <https://www.carbontrust.com/our-work-and-impact/guides-reports-and-tools/briefing-what-are-scope-3-emissions>

<sup>28</sup>National Grid (n.d.) What are Scope 1, 2 and 3 emissions? Available at: <https://www.nationalgrid.com/stories/energy-explained/what-are-scope-1-2-3-carbon-emissions#:~:text=Definitions%20of%20scope%201%2C%202,owned%20or%20controlled%20by%20it.>

# Are *all* laboratory-grown diamonds *sustainable*?

## FACTCHECK:

Laboratory-grown diamonds may not always be as sustainable as some claim. The manufacturing process which lasts a few weeks is energy-intensive, requiring temperatures similar to 20% of that of the Sun's surface<sup>29</sup>. Over 60% of laboratory-grown diamonds are mass-produced in China and India where 63% and 74% of grid electricity results from coal<sup>30</sup>.

From evaluation of publicly available research, the claim that laboratory-grown diamonds always have a low, neutral or even negative carbon footprint is not true. The sustainability of laboratory-grown diamonds from an environmental perspective depends on the energy, chemical, material, water and waste management of the factory in which they are produced. It is also not possible to make a simplistic general comparison between natural diamonds and laboratory-grown diamonds. Each category has a range of production processes, geographical locations, power sources, productivity capabilities, and sustainability practices.

It is also a misconception that laboratory-grown diamonds are mining-free, as stated in some marketing campaigns. Synthetic diamond processes can require graphite and metals, and the reactors in which laboratory-grown diamonds are created, are built with metals which all originate from mining.

Sustainability claims about laboratory-grown diamonds should be supported by evidence on their social footprint too, especially in areas relating to tax payments, employment and human rights, as well as the support provided for local communities in laboratory-grown diamond regions.

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*This chapter focuses largely on environmental sustainability and seeks to address these misconceptions with publicly available data.*

## Background on scale and emissions footprint of laboratory-grown diamonds

The energy required to grow laboratory-grown diamonds depends on many factors including the size of the diamond and the type and age of the machinery used. For example, large stones require more energy to be manufactured. The most significant factor that impacts energy usage is the method used (HPHT or CVD) in their manufacturing. The emissions generated by LGD manufactures depend on the amount of energy required and the energy source used and if electricity is sourced from the national grid, it will depend on the geographical location too.

In 2021, the majority of laboratory-grown diamonds were produced in China (41%) and India (20%)<sup>31</sup>, both of which have a heavy dependence on coal for electricity production<sup>32</sup>. To contextualize levels of production, the \$22 billion global laboratory-grown diamond industry is growing quickly<sup>33</sup>. At the end of 2022, expert industry analyst Paul Zimnisky noted that the output of the laboratory-grown diamond industry has reached between 7-9 million carats<sup>34</sup> and its production capacity is increasing, as estimated output stood at around 6-7 million carats in 2020<sup>35</sup>.

<sup>29</sup>NASA (n.d.) *Temperature of the sun*. Available at: <https://www.nasa.gov/sun>

<sup>30</sup>Our World In Data (n.d.) *Electricity generation -2022, based on BP Statistical Review of World Energy*. Available at: <https://ourworldindata.org/grapher/electricity-generation>

<sup>31</sup>Bain & Company (2021) *The global diamond industry 2020 – 2021*. Available at: [https://www.bain.com/globalassets/noindex/2021/bain\\_report\\_diamond\\_report-2020-21.pdf](https://www.bain.com/globalassets/noindex/2021/bain_report_diamond_report-2020-21.pdf)

<sup>32</sup>Our World In Data (n.d.) *Electricity generation -2022, based on BP Statistical Review of World Energy*. Available at: <https://ourworldindata.org/grapher/electricity-generationWW>

<sup>33</sup>Allied Market Research (2022) *Lab grown diamonds market*. Available at: <https://www.alliedmarketresearch.com/laboratory-grown-diamonds-market-A13694>

<sup>34</sup>Paul Zimnisky (2022) *State of the diamond market Volume 6 Issue 4 – December 2022*. Available at: <https://www.paulzimnisky.com/state-of-the-diamond-market-past-issue-index>

<sup>35</sup>Bain & Company (2021) *The global diamond industry 2020 – 2021*. Available at: [https://www.bain.com/globalassets/noindex/2021/bain\\_report\\_diamond\\_report-2020-21.pdf](https://www.bain.com/globalassets/noindex/2021/bain_report_diamond_report-2020-21.pdf)

## The energy consumption of laboratory-grown diamonds

The energy mix of where laboratory-grown diamonds are produced is important when considering how sustainable they may be because the production of laboratory-grown diamonds is highly energy-intensive. As previously stated, there are two main methods of producing laboratory-grown diamonds, High Pressure High Temperature (HPHT) and Chemical Vapor Deposition (CVD), with the latter being significantly more energy intensive, mainly due to the plasma microwaves that require very high power.

In these processes, energy is required for extreme heating, up to around 1500 degrees<sup>39</sup> and for HPHT for high-pressure conditions. A considerable amount of water is also required in some factories for cooling systems for reactors. Energy is also needed to stabilize the environment within the factory to ensure external conditions do not impact the growth of the synthetic diamond.

If electricity used in the production phases of laboratory-grown diamonds originates from non-renewable sources, this can contribute to laboratory-grown diamond's greenhouse gas emissions.

So, what is the exact carbon footprint of a laboratory-grown diamond? Few laboratory-grown diamond companies transparently disclose or verify such data and the truth is, there is no one single agreed upon figure. It is dependent on multiple conditions including the method of production, region and the methodology used to calculate the footprint. Sphera have estimated that the average emissions per polished carat produced by the CVD process can vary from 260kg CO<sub>2</sub>e to 612kg CO<sub>2</sub>e in India<sup>40</sup>. In the instance that 100% renewable energy is used then their research estimates this figure can be as low as 17kg CO<sub>2</sub>e per polished carat of laboratory-grown diamond<sup>41</sup>.

### CHEMICAL VAPOR DEPOSITION: EXPLAINED

The CVD diamond growth process involves placing seed crystals in a chamber that is filled with gas and heated to temperatures of 900- 1200°C. A microwave beam causes carbon to form out of a plasma cloud which is then deposited onto the crystal to form a diamond. The entire process usually takes 3 weeks to a month before they are ready to be cut and polished<sup>36</sup>.

### HIGH PRESSURE HIGH TEMPERATURE: EXPLAINED

HPHT involves placing a diamond seed into a capsule which is placed into a press. The capsule is heated to temperatures of 1300-1600 °C with pressures above 870,000 pounds per square inch. According to the GIA, this pressure is roughly equivalent to the pressure exerted by a commercial jet airplane if balanced on the tip of a person's finger<sup>37</sup>. Metal in the growth capsule melts and dissolves the high purity carbon source and carbon atoms are then deposited on the seed crystal to generate diamond growth<sup>38</sup>. Following conversations with industry professionals, we learnt that each HPHT reactor can weigh around 50 tonnes.

CVD LABORATORY-GROWN DIAMONDS

<sup>36</sup>GIA (2016) HPHT and CVD diamond growth processes. Available at: <https://www.gia.edu/hpht-and-cvd-diamond-growth-processes>

<sup>37</sup>GIA (2017) Observations on HPHT-Grown Synthetic Diamonds: A Review. Available at: <https://www.gia.edu/gems-gemology/fall-2017-observations-hpht-grown-synthetic-diamonds>

<sup>38</sup>Ibid.

<sup>39</sup>NASA (n.d.) Temperature of the sun. Available at: <https://www.nasa.gov/sun>

<sup>40</sup>Sphera (2021) Research based sustainability brief on laboratory-grown diamonds from chemical vapor deposition technology. Available at: <https://pandoragroup.com/-/media/Files/Sustainability/Brilliance/Sphera-statement.pdf>

<sup>41</sup>Ibid

## The carbon footprint of a one carat cut and polished laboratory-grown diamond

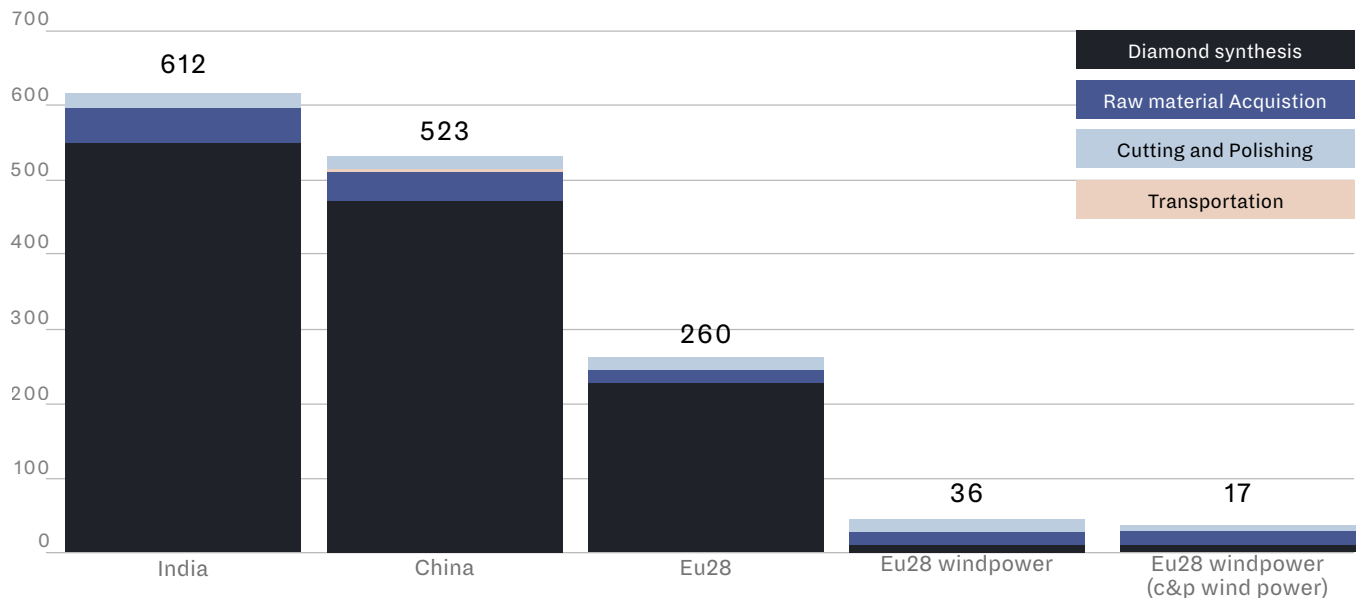


Figure 3 - The carbon footprint of a one carat cut and polished laboratory-grown diamond. Source: Sphera<sup>42</sup>

Within this market, different laboratory-grown producers use different reactors in their production processes which have varying energy efficiencies. This further impacts the accuracy of generalized figures that are often used. Just as some natural diamond companies use renewable energy, there are instances where laboratory-grown diamonds use renewable sources for their processes. Hydropower is a reliable renewable source and it can provide a constant source of high-energy stringently required for the growing process of a synthetic diamond. In these instances, it is fair to say that these laboratory-grown diamonds are more environmentally sustainable than orthodox mass-produced laboratory-grown diamonds where factories and machinery rely heavily on fossil fuels and non-renewable sources.

To navigate these complexities and if it is of interest, buyers should ask for carbon footprint data from the specific laboratory-grown diamond factory that produced their diamond. There is limited data and transparency about carbon emissions from laboratory-grown diamonds. The International Grown Diamond Association plans to work with its members to address the lack of disclosure about its environmental impact<sup>43</sup>.

Also, claims that laboratory-grown diamonds always have a lower carbon footprint and thereby are always more sustainable than natural diamonds, are not true. The answer is dependent on numerous variables, especially in the natural diamond recovery process like geography, productivity of the mine<sup>44</sup> and the use of renewable energy.

There is a common misconception that laboratory-grown diamonds are always mining free. This is not entirely true. Laboratory-grown diamond synthesis requires the production of machines to carry out various processes. Machinery and machine processes involved at laboratory-grown diamond factories like the presses are made of high-grade steel, a material that has a high level of embodied carbon<sup>45</sup>. Additionally, manufacturing HPHT synthetic diamonds requires graphite, metals like nickel, iron and cobalt and pyrophyllite - albeit in small quantities<sup>46</sup>. Equally, synthetic diamonds produced via CVD require methane and hydrogen, of which methane is generally sourced from the mining of fossil fuels like gas, oil and coal<sup>47</sup>.

*The detailed process of raw material extraction for laboratory-grown diamonds can be found in the Appendix<sup>48</sup>.*

<sup>42</sup>Ibid

<sup>43</sup>Vogue Business (2019) Are mined diamonds more environmentally friendly? Not so fast. Available at: <https://www.voguebusiness.com/technology/mined-diamonds-environmentally-friendly-debeers-dpa>

<sup>44</sup>Diamond Council (2015) Discovery and mining. Available at: [https://dcec.diamondcouncil.org/Documents/CourseMaterials/DiamondCourse/D\\_Lesson\\_11.pdf](https://dcec.diamondcouncil.org/Documents/CourseMaterials/DiamondCourse/D_Lesson_11.pdf), BBC (2020) The sparkling rise of the lab grown diamond.

<sup>45</sup>Building Green (n.d.) The urgency of embodied carbon. Available at: [https://www.buildinggreen.com/feature/urgency-embodied-carbon-and-what-you-can-do-about-it#:~:text=Mithun%20\(Meghan%20Lewis\)-,Steel,ton%20of%20greenhouse%20gas%20emissions.](https://www.buildinggreen.com/feature/urgency-embodied-carbon-and-what-you-can-do-about-it#:~:text=Mithun%20(Meghan%20Lewis)-,Steel,ton%20of%20greenhouse%20gas%20emissions.)

<sup>46</sup>V. Zhdanov et al (2021) A Comparative Analysis of Energy and Water Consumption of Mined versus Synthetic Diamonds. *Energies* 2021, 14, 7062. <https://doi.org/10.3390/en14217062>

<sup>47</sup>JCK Online (2023) No, laboratory-grown diamonds are not mining free. Available at: <https://www.jckonline.com/editorial-article/laboratory-grown-diamonds-mining-free/>

<sup>48</sup>See Appendix on page 48

On water usage, some HPHT factories require the use of large volumes of water to cool their equipment and maintain humidity levels conducive for synthetic diamond growing.

In China, where the majority of HPHT production takes place, factories use common water reservoirs to cool the HPHT presses and this reservoir water can be used multiple times. Research has found that in general, water consumption for the HPHT and CVD methods is materially insignificant, approximately zero and 0.002 m3 per carat, respectively<sup>49</sup>. When it comes to exact figures on water recycling, there is little publicly available data on this to review.

#### A NOTE ON GREENWASHING

Lastly, the global crackdown on greenwashing, specifically on misleading environmental claims has addressed the sustainability statements made by certain producers of laboratory-grown diamonds.

The Federal Trade Commission in the United States sent warning letters to companies in 2019<sup>50</sup> regarding their diamond advertisement disclosures and notes that any campaigns that claimed products were ‘eco-friendly’, ‘eco-conscious’, or ‘sustainable’, without specific evidence or data to back this up would be under review<sup>51</sup>.

It also started a public consultation process with the purpose to review its Green Guides. The UK’s Competition and Markets Authority (CMA) published its Green Claims Code<sup>52</sup> and France has brought in fines against companies found to be greenwashing<sup>53</sup>.

The European Union has also announced a set of new legislations aimed at tackling eco-claims. This underscores the importance of ensuring that any sustainability claims made by producers of laboratory-grown diamonds can be sustained and are underpinned by robust evidence.

### What about laboratory-grown diamonds’ social sustainability performance?

Any broad claims that laboratory-grown diamonds are always a sustainable option must consider the social implications of the industry across the entire supply chain too.

Whilst this chapter has focused a lot on environmental sustainability, social conditions relating to employment and human rights, as well as the impact and mediation with local communities in laboratory-grown diamond regions are fundamental to ensuring that laboratory-grown diamonds can justify their ethical sourcing claims.

There is less access to published data and information about the social footprint of laboratory-grown diamond manufacturers and they are not held to account on reporting guidelines.

Additionally, as laboratory-grown diamond production has a business model that relies on technology-based manufacturing, the number of employees it must hire for direct production are significantly smaller than that of the natural diamond industry, there is a much smaller local procurement, and incomparably less infrastructure and social investments made or partnerships developed with local communities.

This means that they do not have the same socio-economic benefits for communities or positive social multiplier effect as natural diamonds have. The natural diamond industry operates largely in developing countries, contributing to the important economic development of producer countries.

*Read more about this later on in our study.*

<sup>49</sup>V. Zhdanov et al (2021) A Comparative Analysis of Energy and Water Consumption of Mined versus Synthetic Diamonds. *Energies* 2021, 14, 7062. <https://doi.org/10.3390/en14217062>

<sup>50</sup>FTC (2019) Warning letters regarding diamond ad disclosure. Available at: <https://www.ftc.gov/news-events/news/press-releases/2019/04/ftc-sends-warning-letters-companies-regarding-diamond-ad-disclosures>

<sup>51</sup>Guardian (2020) Are lab grown diamonds the more ethical choice to say I do? Available at: <https://www.theguardian.com/lifeandstyle/2020/mar/10/diamonds-laboratory-grown-climate-change>

<sup>52</sup>UK Government (n.d.) Green claims code. Available at: <https://greenclaims.campaign.gov.uk/>

<sup>53</sup>Responsible Investor (2021) France brings in fines against greenwashing. Available at: <https://www.responsible-investor.com/france-brings-in-fines-against-greenwashing/>

# What is the natural diamond industry doing to *reduce its carbon footprint* and *protect biodiversity*?

## FACTCHECK:

The natural diamond industry has set out on its journey to decarbonize in line with global climate targets. As part of their carbon reduction strategies, Natural Diamond Council members are developing renewable energy projects in partnership often in developing countries where it is harder to source such energy, carbon offsetting projects, as well as investing in programs to sequester carbon.

Companies like the De Beers Group are committed to becoming carbon neutral by 2030<sup>54</sup> and Rio Tinto of achieving net zero emissions by 2050<sup>55</sup>. Natural Diamond Council members are also involved in unique programs to sequester carbon such as by using kimberlite, the rock where diamonds are found or through various nature-based solutions.

The natural diamond world protects the biodiversity of an area almost 4 times the land they use, equivalent to the size of New York City, Chicago, Washington and Las Vegas combined. 99% of waste from diamond recovery is rock and 84% of the water used in diamond recovery is recycled<sup>56</sup>. The natural diamond industry abides global environmental standards and stringent national laws.

Before a single diamond is recovered, environmental permissions must be granted by governments with a legal obligation for ongoing monitoring, reporting and closure plans.

The previous chapter sought to address misconceptions surrounding sustainability claims made about laboratory-grown diamonds. Now, we look to the natural diamond industry to explore how leading players are focusing on mapping and reducing their carbon footprint.

## Factors that influence the difference in carbon emissions recorded by the industry

There are many contributing factors to the difference in carbon emissions recorded by the industry. Including mainly the availability of clean energy at mine locations, the production or yield capacity of a mine, as well as which of the exact stages of mining are included in methodologies.

It is estimated that for a 1 carat polished natural diamond, the emissions are 106.9kg CO<sub>2</sub>e in 2019 (Scope 1 and 2)<sup>57</sup>. This equates to driving 265 miles in a medium sized car which runs on gasoline and driving just under the distance of driving from Los Angeles to Las Vegas<sup>58</sup>.

## How is the natural diamond industry working to decarbonize?

The natural diamond industry has set out on its journey to decarbonize in line with global climate targets. Leaders like De Beers Group have set the goal of becoming carbon neutral across their operations (Scope 1 and 2) by 2030 and are making progress, having achieved a 11% year-on-year reduction in energy intensity in 2021<sup>59</sup>. Rio Tinto has the goal to reduce GHG emissions by 50% by 2030<sup>60</sup>.

There are many opportunities for large-scale mining companies to reduce their Scope 1-3 emissions and NDC members are demonstrating progress. This section outlines how companies are working to decarbonize and where future efforts can be concentrated.

<sup>54</sup>De Beers (2021) Sustainability report 2021. Available at: <https://www.debeersgroup.com/-/media/Files/D/De-Beers-Group-V2/documents/building-forever/building-forever-our-2021-sustainability-report.pdf>

<sup>55</sup>Rio Tinto (2022) Climate change report. Available at: <https://www.riotinto.com/en/invest/reports/climate-change-report>

<sup>56</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>57</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>58</sup>US Environmental Protection Agency (n.d.) Greenhouse Gas Equivalencies Calculator. Available at: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results>

<sup>59</sup>De Beers (2021) Sustainability report 2021. Available at: <https://www.debeersgroup.com/-/media/Files/D/De-Beers-Group-V2/documents/building-forever/building-forever-our-2021-sustainability-report.pdf>

<sup>60</sup>Rio Tinto (2022) Climate change report. Available at: <https://www.riotinto.com/en/invest/reports/climate-change-report>

SCOPE 1 AND 2	<p>Steps to reduce Scope 1 and 2 emissions include improving operational efficiency, increasing the use of sustainable fuels, and switching to sustainable drive trains, which are the components of a motor vehicle that deliver power to the wheels, for vehicles and machinery.</p> <p>Electrification of mining processes as well as the adoption of hydrogen fuel cells and battery electric vehicles are promising developments for the diamond industry. De Beers Group parent company Anglo American is developing a 300-metric ton fuel cell electric vehicle (FCEV) haulage truck and Newmont Goldcorp has set up the world's first fully electric mine at Borden in Canada<sup>61</sup>.</p> <p>In Canada, De Beers Group are designing a mine which incorporates low carbon energy and uses only renewable sources. In addition, the Chidliak Diamond Project is exploring the use of synthetic fuels and biofuels<sup>62</sup>. Switching to more sustainable biofuels for trains has the potential to decrease carbon emissions by over 70% according to McKinsey<sup>63</sup>.</p>
SCOPE 2	<p>Using green sources of electricity has the power to reduce more than 50% of current emissions output and is essential to reducing Scope 2 emissions<sup>64</sup>. Multiple alternatives exist including purchasing green electricity and using solar panels. NDC members are working to fully integrate renewable electricity. For example, Rio Tinto's Gudai-Darri mine in Western Australia will have 65% of its total electricity consumption supplied by a combination of solar farms and battery storage<sup>65</sup>.</p> <p>Rio Tinto's Diavik Diamond Mine in Canada has encompassed renewable energy in its operations in sub-arctic conditions. It operates as one of the world's largest remote mining hybrid wind-diesel power facilities. Since it was commissioned in 2012, it produced 8.5% of the mine's power in 2013 and in the same year saved 3.8 million liters of fuel<sup>66</sup>. They have even developed defrosting technology to prevent their 4 9.2-megawatt wind turbines from freezing<sup>67</sup>.</p> <p>De Beers Group is also looking to replace fossil fuels where possible and is working closely with Anglo American on the development of solar and wind energy, through a regional renewable energy ecosystem, for its mines in South Africa and Namibia<sup>68</sup>. De Beers Group is also purchasing renewable energy for retail operations in the UK and US<sup>69</sup>.</p>
SCOPE 3	<p>Notoriously hard to map, manage and report on, Scope 3 emissions remain a focus for the natural diamond mining industry. To reduce value chain emissions, achievable wins can focus on material procurement and sustainable alternatives. For example, inputs for infrastructure and materials needed for the development of mines like cement, steel and lime, all with high levels of embodied carbon.</p> <p>Alternatives like green steel<sup>70</sup> and sustainable cement<sup>71</sup> offer one plausible solution. Companies can also advocate for the adoption and scale of renewable energy projects near diamond processing sites across the value chain, like Surat in India. An important part of reducing Scope 3 emissions also surrounds proactive stakeholder engagement.</p> <p>As these operations are outside of the direct control of natural diamond companies, it is about working with suppliers and encouraging them to take measures themselves<sup>72</sup>.</p>

<sup>61</sup>Ibid.<sup>62</sup>De Beers Canada via Youtube (2022) Chidliak project proposal. Available at: <https://www.youtube.com/watch?v=41M30xpxL0M><sup>63</sup>McKinsey (n.d.) Creating the zero-carbon mine. Available at: <https://www.mckinsey.com/industries/metals-and-mining/our-insights/creating-the-zero-carbon-mine><sup>64</sup>McKinsey (n.d.) Creating the zero-carbon mine. Available at: <https://www.mckinsey.com/industries/metals-and-mining/our-insights/creating-the-zero-carbon-mine><sup>65</sup>Rio Tinto (n.d.) Our first solar plant to power new iron ore mine. Available at: <https://www.riotinto.com/en/news/stories/first-solar-plant><sup>66</sup>Canadian Mining and Energy (2014) Diavik Diamond Mine powers up with wind. [https://www.miningandenergy.ca/sustainability/article/diavik\\_diamond\\_mine\\_turns\\_to\\_wind/](https://www.miningandenergy.ca/sustainability/article/diavik_diamond_mine_turns_to_wind/)<sup>67</sup>Rio Tinto (n.d.) Diavik. Available at: <https://www.riotinto.com/en/can/canada-operations/diavik><sup>68</sup>Anglo American (2022) Anglo American and EDF Renewables agree to renewable energy partnership in South Africa to form Envusa Energy. Available at: <https://www.angloamerican.com/media/press-releases/2022/04-10-2022><sup>69</sup>De Beers Group (2021) Sustainability report 2021. Available at: <https://www.debeersgroup.com/-/media/Files/D/De-Beers-Group-V2/documents/building-forever/building-forever-our-2021-sustainability-report.pdf><sup>70</sup>WEF (2022) Green steel. Available at: <https://www.weforum.org/agenda/2022/07/green-steel-emissions-net-zero/><sup>71</sup>McKinsey (n.d.) Creating the zero-carbon mine. Available at: <https://www.mckinsey.com/industries/metals-and-mining/our-insights/creating-the-zero-carbon-mine><sup>72</sup>CDP (2022) 4 steps for reducing Scope 3 emissions. Available at: <https://www.cdp.net/en/articles/supply-chain/4-steps-for-reducing-scope-3-emissions-and-accelerating-action-through-your-supply-chain>

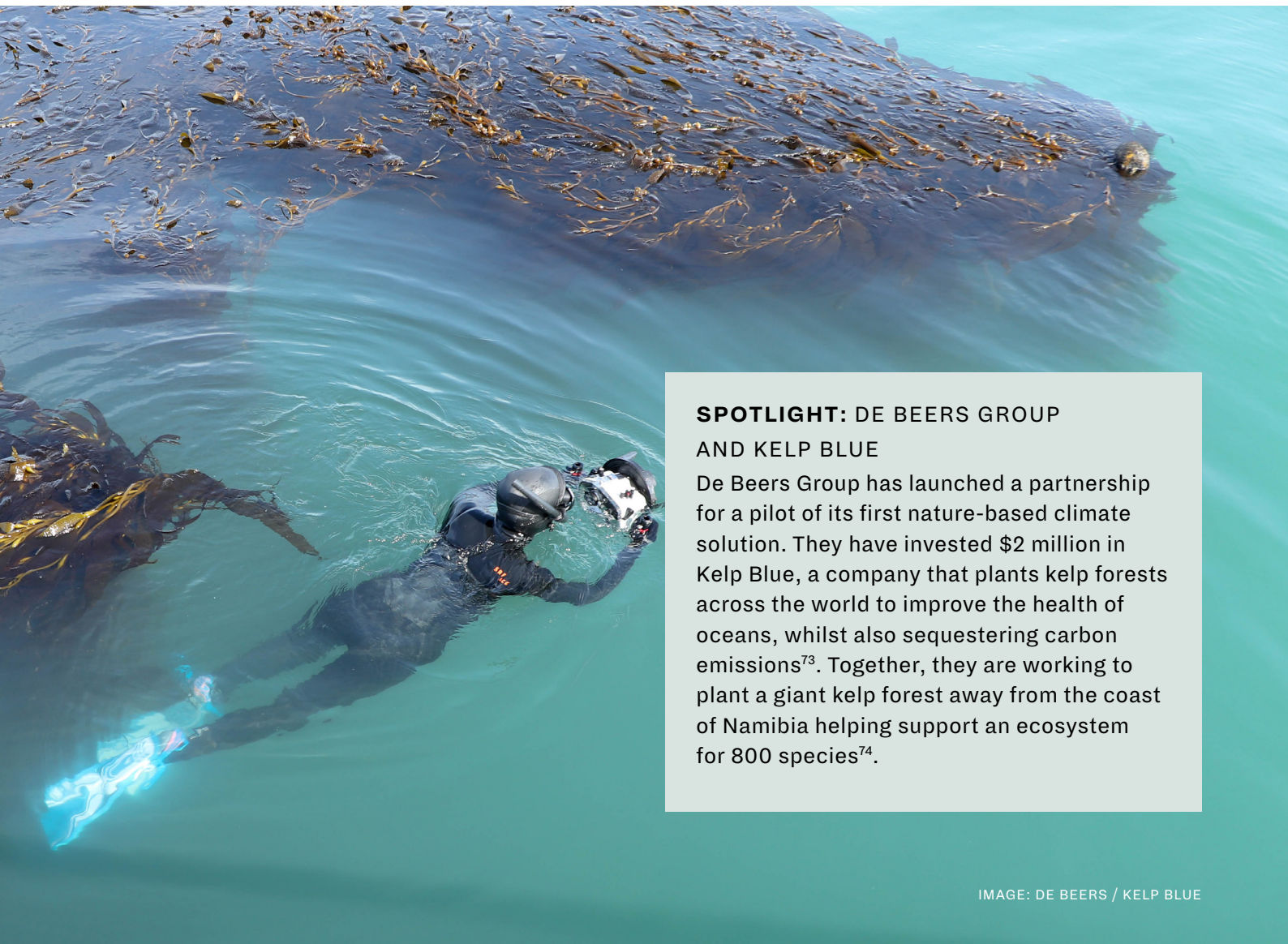
## Reducing impact through carbon absorption, offsetting and conservation projects

Beyond emissions reduction strategies, NDC members are actively involved in offsetting projects and conservation efforts that help to remove carbon from the atmosphere and thus contribute to their climate goals.

Petra Diamonds is pursuing carbon sequestration initiatives. They are working with academic institutions that are exploring carbon sequestration through the mineralization of mining waste, specifically kimberlite tailings.

For the emissions that the company cannot mitigate or replace with alternative energy sources, they are engaging in offsetting projects like the Wonderbag initiative which re-invests carbon offset financing back into communities and is verified by numerous carbon standards and protocols<sup>75 76</sup>.

A final example is CarbonVault which is a research program supported by the De Beers Group that is dedicated to exploring ways to lock away carbon in kimberlite<sup>77</sup>.



### SPOTLIGHT: DE BEERS GROUP AND KELP BLUE

De Beers Group has launched a partnership for a pilot of its first nature-based climate solution. They have invested \$2 million in Kelp Blue, a company that plants kelp forests across the world to improve the health of oceans, whilst also sequestering carbon emissions<sup>73</sup>. Together, they are working to plant a giant kelp forest away from the coast of Namibia helping support an ecosystem for 800 species<sup>74</sup>.

IMAGE: DE BEERS / KELP BLUE

<sup>73</sup>Kelp Blue (n.d.) Available at: <https://kelp.blue/>

<sup>74</sup>De Beers Group (2021) Kelp Blue. Available at: <https://www.debeersgroup.com/sustainability-and-ethics/protecting-the-natural-world/kelp-blue>

<sup>75</sup>Petra Diamonds (2022) Protecting our planet. <https://www.petradiamonds.com/wp-content/uploads/Pages-63-81-of-SR.pdf>

<sup>76</sup>Wonderbag (n.d.) Carbon. Available at: <https://www.wonderbagworld.com/carbon>

<sup>77</sup>De Beers Group (n.d.) CarbonVault. Available at: <https://www.debeersgroup.com/sustainability-and-ethics/protecting-the-natural-world/carbon-vault>

## What is the natural diamond industry doing to protect biodiversity?

### FACTCHECK

Members of the Natural Diamond Council are always working, often in partnership with governments and local communities, to reduce the impact that natural diamond mining can have on the environment. The natural diamond world protects the biodiversity of an area equivalent to the size of New York City and Los Angeles combined. NDC members protect around 4 times the land they use. 99% of waste from diamond recovery is rock and 84% of the water used in diamond recovery is recycled<sup>78</sup>. The focus on stewardship of diamond mines by NDC members begins from the exploration phase through to the closure phase and is regulated by global environmental laws as well as national and industry regulations.

Every diamond mining operation has a different environmental impact, depending on the type of mining involved, whether it is alluvial, beach, marine or pipe mining. Equally, it is important to distinguish between artisanal and small-scale mining (ASM) and modern large-scale diamond mining when discussing the environmental impact. ASM represents 10-15% of the natural diamond market<sup>79</sup> and refers to mining by individuals, groups, or cooperatives that often take place in the informal sector of the market<sup>80</sup> and there is often less data available on details of the ASM sector's footprint. They may be held to less account on regulations and reporting standards than global mining organizations that are publicly listed companies.

There are numerous operational measures being taken to mitigate and reduce the impact on the environment. This includes conservation efforts, rewilding projects as well as waste and water management.

Information surrounding diamond recovery processes provided by NDC members details that because no chemicals are used in the extraction process, it does not cause any irreversible damage

on the environment. What it does change is the landscape as it creates waste rock piles, however these are reclaimed by the landscape as part of mine closure plans which are done under the strict supervision and approval of local communities and governments. Topography is not the same as damage. Land can be restored to land use acceptable to the local community.

In recent years, there has been an important focus on water recycling. During the diamond mining process, members consume water from sources on-site including surface water, ground water and third-party supply<sup>81</sup>. As diamond recovery is reliant on a mechanical crushing process, water is more suitable for recycling and reuse<sup>82</sup>. Large-scale mining companies are working to reduce their dependencies, especially in water-scarce regions, by promoting the use of water recycling. For example, in 2022 Petra recorded that their water recycling initiatives had resulted in 80% of water used being recycled on site.<sup>83</sup> Lucara Diamond has also set an overarching goal of 'zero discharge' operations, to engage and share data with neighboring agricultural water users and to provide surplus water from their pit<sup>84</sup>.

<sup>78</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>79</sup>Natural Diamond Council (2020) Creating a force for good to support artisanal miners. Available at: <https://www.naturaldiamonds.com/industry-news/creating-a-force-for-good-to-support-artisanal-miners-2/>

<sup>80</sup>European Commission (n.d.) Artisanal and small-scale mining. Available at: [https://rmis.jrc.ec.europa.eu/?page=artisanal-and-small-scale-mining-a6f8a3#:::text=Artisanal%20and%20small%20scale%20mining%20\(ASM\)%20refers%20to%20mining,and%20requires%20low%20investment%20levels.](https://rmis.jrc.ec.europa.eu/?page=artisanal-and-small-scale-mining-a6f8a3#:::text=Artisanal%20and%20small%20scale%20mining%20(ASM)%20refers%20to%20mining,and%20requires%20low%20investment%20levels.)

<sup>81</sup>ERM (2022) NDC Sword & Shield Library report. Internal research

<sup>82</sup>ERM (2022) NDC Sword & Shield Library report. Internal research

<sup>83</sup>Petra Diamonds (2022) Petra Diamonds Sustainability Report. Available at: <https://www.petradiamonds.com/wp-content/uploads/Petra-Diamonds-Limited-Sustainability-Report-2022-1.pdf>

<sup>84</sup>Lucara Diamond (n.d.) Sustainability reports. Available at: <https://lucaradiamond.com/sustainability/sustainability-reports/>

## What is the industry doing about the waste from mining?

Over 99% of waste produced by NDC members is rock which is disposed of on-site and eventually reclaimed as part of the landscape during the mine closure and rehabilitation<sup>85</sup>. De Beers Group separates waste at the source across a variety of materials ranging from metals, glass and plastic through to batteries<sup>86</sup>. De Beers Group majority shareholder Anglo American has also developed a Materials Stewardship strategy to encourage waste management focused on the principles of the circular economy<sup>87</sup>. Petra Diamonds recorded in 2022 that it had recycled 85% of waste from its local operations<sup>88</sup>.

Large-scale mining companies recognize the value of biodiversity and ecosystem services. They employ geologists, biologists and environmental experts to develop programs and ensure all operations are in compliance with environmental regulations and that the land is managed and protected correctly. Through policy and reporting standards, the companies are committed to regular monitoring and sharing information on energy usage, air quality, vegetation and biodiversity impact.

Research conducted by environmental consultancy ERM details NDC members efforts to work towards the UN Sustainable Development Goal 15 – Life on Land. NDC members protect close to 4 times the land they use for mining through biodiversity conservation and wildlife protection. At a significant 2020 square km, the size of the land conserved for biodiversity is equivalent to the size of the total area of New York City and Los Angeles. It is also comparable to the size of four cities; New York City, Washington, Chicago and Las Vegas combined (1912 square km)<sup>89</sup>.

Here are some examples. Each De Beers Group operation that is active has biodiversity management plan in place. The company notes that several of their operations measure compliance against the TSM biodiversity protocol, an industry-led voluntary certification program developed by the Mining Association of Canada<sup>90</sup>.

An example of successful land protection is The Diamond Route, a network of 8 conservation sites established by De Beers Group. The network spans over 722 square miles of critical habitats in South Africa and Botswana. In addition to protecting endangered wildlife, The Diamond Route creates unique learning opportunities for students, scientists and academics<sup>91</sup>.

Another case is the De Beers Group Moving Giants initiative, that aims to safely translocate elephants with the Peace Parks Foundation to find them safe homes and secure their future in Mozambique<sup>92</sup>.

Other examples include Petra Diamonds who have funded a four-year Birdlife Africa Secretary bird project on an endangered bird species. This resulted in the publication of a scientific article on the feeding and breeding of the bird species.

They have also started a bee pollinator conservation project where bees are removed from the workplace and placed in a safe environment. Operational sites have trained beekeepers to place bees in well secured hives.

Both Rio Tinto and Arctic Canadian Diamond Company manage Wildlife Monitoring Programs. Similarly, RZM Murowa have a strict relocation program of crocodiles and pythons with the support of the local Parks and Wildlife Authority. Lucara Diamond are driving a research project with Birdlife Botswana to assess the impact of mining on insects and birds. They also have plans to drill a borehole for a plantation area where the community can cultivate plants to use in basket weaving and other projects.

<sup>85</sup>Petra Diamonds (2022) Petra Diamonds Sustainability Report. Available at: <https://www.petradiamonds.com/wp-content/uploads/Petra-Diamonds-Limited-Sustainability-Report-2022-1.pdf>

<sup>86</sup>Lucara Diamond (n.d.) Sustainability reports. Available at: <https://lucaradiamond.com/sustainability/sustainability-reports/>

<sup>87</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>88</sup>De Beers (2019) Our material topics progress. Available at: <https://www.debeersgroup.com/-/media/Files/D/De-Beers-Group-V2/documents/building-forever/our-material-topics-progress-2019-report.pdf>

<sup>89</sup>Anglo American (n.d.) Sustainable mining plan. Available at: <https://www.angloamerican.com/sustainable-mining-plan/healthy-environment>

<sup>90</sup>Petra Diamonds (2022) Petra Diamonds Sustainability Report. Available at: <https://www.petradiamonds.com/wp-content/uploads/Petra-Diamonds-Limited-Sustainability-Report-2022-1.pdf>

<sup>91</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>92</sup>De Beers Group (2021) Sustainability report 2021. Available at: <https://www.debeersgroup.com/-/media/Files/D/De-Beers-Group-V2/documents/building-forever/building-forever-our-2021-sustainability-report.pdf>

<sup>93</sup>De Beers Group (n.d.) The Diamond Route. Available at: <https://www.debeersgroup.com/sustainability-and-ethics/protecting-the-natural-world/the-diamond-route>

<sup>94</sup>De Beers Group (n.d.) Moving giants. Available at: <https://www.debeersgroup.com/sustainability-and-ethics/protecting-the-natural-world/moving-giants>

## Regulations and planning for a positive mining legacy

NDC members are focused on creating a sustainable legacy and going above and beyond regulatory and environmental compliance. All members have to comply with international and environmental legislation aligned with standards including ISO 14001, which provides a framework for effective environmental management systems. This runs alongside reporting requirements in line with the GRI Mining and Metals Sector Supplement and other corporate sustainability reporting guidelines and frameworks<sup>93</sup>.

The stewardship of mines throughout their life cycle underscores the strict rules that mining companies must follow, related to both post-mining land use and economic plans to support the socio-economic prosperity of communities. Permits are not provided without details of impact mitigation, a sophisticated closure plan and proof of financial resources to support a sustainable exit.

A mining closure plan involves how a site would be managed at the end of its productive life, the activities to achieve closure goals and how the land can be rehabilitated<sup>94</sup>.

In an interview, a representative from De Beers Group noted that “We need to be planning for closure right from the design of the mine.”<sup>95</sup>, which is what the large-scale mining industry is doing.

The Intergovernmental Forum on Mining, Minerals, Metals & Sustainable Development outlines closure plans should include stakeholder engagement, risk analysis, close monitoring and maintenance as well as financial assurance and many other areas<sup>96</sup>.

Varying geographies have a range of regulations pertaining to environmental mining regulations and closure plans. For example, in Canada there is the Canadian Environment Protection Act administered by the Environment and Climate Change Canada (ECCC).

According to Ryan Fequet, Executive Director for the Wek’èezhii Land and Water Board, the Northwest Territories (NWT, Canada) have Land

Claim Agreements and a unique, progressive and empowering piece of legislation called the Mackenzie Valley Resource Management Act. This ensures a transparent, holistic and integrated approach to renewable and non-renewable resource management. Regional Land and Water Boards of the Mackenzie Valley support in the licensing on everything from water use and wastewater management to land use. These licenses have strict reporting and monitoring requirements too<sup>97</sup>. Further expansion of their policies and guidelines can be found in the Annex.

Additionally, in Canada there is the Mining Association of Canada’s Towards Sustainable Mining (TSM) standard that supports mining companies in managing key environmental and social risks. With this standard, an independent board completes an environmental assessment and also uses tools like Socio-Economic Agreements. A SEA sets out commitments and predictions made by a company regarding their impact. This is then monitored and published in a yearly report to the Government of the Northwest Territories<sup>98</sup>.

In South Africa, regulations over mining begin at the scoping phase all the way through to closure. As of 2010, mining became a listed activity. The environmental provisions of the National Environmental Management Act (NEMA) No. 107 of 1998 now apply to mine closure certification resulting in mines having to comply with stipulations of this Act too before qualifying for closure<sup>99</sup>. NEMA underlined that public consultation is essential at the early stages of projects.

Elsewhere in Australia, the Government of Western Australia Department of Mines and Petroleum (2017) Mining Rehabilitation Fund – Guidance and The Mining Rehabilitation Fund (MRF) Act of 2012 approach important issues related to funding the closure and rehabilitation of abandoned mines. This goes against the narrative that mining companies simply enter a region and leave with no accountability<sup>100</sup>.

<sup>93</sup>Natural Diamond Council (n.d.) The framework for an ethical and sustainable diamond industry. Available at: <https://www.naturaldiamonds.com/industry-insights/the-framework-for-an-ethical-and-sustainable-diamond-industry/>

<sup>94</sup>APEC (2018) Mine closure checklist for governments. Available at: [https://www.apec.org/docs/default-source/Publications/2018/3/Mine-Closure-Checklist-for-Governments/218\\_MTF\\_Mine-Closure\\_Checklist-for-Governments.pdf](https://www.apec.org/docs/default-source/Publications/2018/3/Mine-Closure-Checklist-for-Governments/218_MTF_Mine-Closure_Checklist-for-Governments.pdf)

<sup>95</sup>Fashionista (2019) How do you responsibly close a diamond mine. Available at: <https://fashionista.com/2019/12/orapa-botswana-diamond-mine-closing-ethics-responsibility>

<sup>96</sup>Intergovernmental forum on mining, minerals, metals and sustainable development. IGF case study – mine closure policies in South America. Available at: <https://www.iisd.org/system/files/2021-01/igf-case-study-mine-closure-south-america-en.pdf>

<sup>97</sup>The Land and Water Board (n.d.) LWB Policies and Guidelines. Available at: <https://mvlwb.com/resources/lwb-policies-and-guidelines>

<sup>98</sup>The Mining Association of Canada (n.d.) Towards sustainable mining. Available at: <https://mining.ca/towards-sustainable-mining/>

<sup>99</sup>University of Johannesburg (2011) A critical analysis of the mine closure process as followed by the De Beers Group Oaks Diamond Mine, Limpopo Province, South Africa. Available at: <https://core.ac.uk/download/18219063.pdf>

<sup>100</sup>Government of Western Australia – Department of Mines, Industry Regulation and Safety (2017) Mining Rehabilitation Fund. Available at: <http://www.dmp.wa.gov.au/Documents/Environment/ENV-MEB-382.pdf>

## IN FOCUS: MINING REGULATIONS AND GUIDELINES

Whilst not an exhaustive list, the list below details initiatives, guidelines and frameworks which highlight the level of regulation on opening mines and closures:

- **Australian Government (2016) Mine Closure** – Leading Practice Sustainable Development Program for the Mining Industry: introduction to mine closure and current leading practices from an Australian perspective.
- **ANZMEC (2000) Strategic Framework for Mine Closure**
- **ICMM (2008) Planning for Integrated Mine Closure** – A Toolkit: provides a broadly conceived life cycle and risk-based approach to closure planning.
- **Mining Association of Canada (2008) Towards Sustainable Mining** – Mine Closure Framework: an industry-led initiative to articulate the commitment of member companies to promote responsible mine closure.
- **NOAMI (2010) Policy Framework in Canada for mine closure and management of long-term liabilities**
- **World Bank Multistakeholder Initiative (2010) Towards Sustainable Decommissioning and Closure of Oil Fields and Mines**: provides a policy-oriented series of toolkits related to closure for both oil fields and mines.
- **Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) (2013) The IGF Mining Policy Framework**: Mining and Sustainable Development: lays out a framework which provides a comprehensive model for policy that will allow mining to make its maximum contribution to the sustainable development of developing countries.

## Responsible mine restoration

With the closure of Argyle in Australia, as one of the most symbolic natural diamond mines, responsible mine restoration has come into focus. It takes on average 10 years to open a mine. Having a closure plan is a prerequisite to opening a mine, in addition to Social and Environmental Impact Assessments which are audited, approved and monitored by governments and local community.

### SPOTLIGHT: THE VICTOR MINE

Based in Ontario Canada, the Victor Mine halted production in May 2019 and demolition of its operational facilities started in 2020. De Beers Group has worked to rehabilitate the mines waste rock repositories and separate recyclable vs non-recyclable waste arising throughout the demolition. They have planted over 150,000 spruce trees and rehabilitated approximately 328 hectares of the mine's disturbed operational footprint, using commercial seed and seedlings propagated both onsite and offsite. The company is using field-based and remote-sensing programs to track progress<sup>101</sup>.

ONTARIO, CANADA

<sup>101</sup>De Beers Canada (n.d.) Victor mine. Available at: <https://canada.debeersgroup.com/operations/mining/victor-mine>



IMAGE: RIO TINTO

## **SPOTLIGHT:** RIO TINTO – DIAVIK MINE

Set in the Northwest Territories of Canada, the Diavik mine, owned by Rio Tinto is set to close in 2025, after opening in 2003. The company have designed the mine in a way to minimize disturbance once it comes to the end of its life. Rio Tinto has used engineering technology and techniques that hold back the waters of the Lac de Gras to minimize disturbance to surrounding wildlife and communities. They have plans to build back the embankment to ensure lake water can flow back into the open pit<sup>102</sup>.

Further projects to support responsible mine restoration include Rio Tinto's collaboration with RESOLVE, a non-profit organization. They have worked together to launch Regeneration, which is a company that will use re-mining and processing of waste from legacy mine sites to support rehabilitation activities and restore natural environments. Rio Tinto has committed to initially invest \$2 million into the company<sup>103</sup>.

Elsewhere, NDC members De Beers Group and Rio Tinto are working together on the Reimagining Closure project with the intention to identify opportunities for life after diamond mining in the Slave Geological Province (SGP) in the NWT

of Canada as mining activity winds down. This focuses on socio-economic planning and support whilst engaging with numerous stakeholders including indigenous governments, federal governments, mining companies, businesses, and communities as well as conservation bodies<sup>104</sup>.

The details of these efforts underline that the natural diamond industry is working to minimize the impact mines have on the environment through a focus on land restoration, as well as seeking positive post-mining opportunities via socio-economic rehabilitation for communities in surrounding regions.

<sup>102</sup>Rio Tinto (n.d.) Innovation at Diavik. Available at: <https://www.riotinto.com/en/operations/canada/diavik#:~:text=All%20mines%20have%20a%20finite,back%20into%20the%20open%20pit.>

<sup>103</sup>Rio Tinto (2021) Rio Tinto invests in start-up to support habitat restoration. Available at: <https://www.riotinto.com/en/news/releases/2021/rio-tinto-invests-in-start-up-to-support-habitat-restoration-final>

<sup>104</sup>Life After Diamond Mining (n.d.) Process. Available at: <https://lifeafterdiamondmining.com/process>

# Are natural diamonds *rare*?

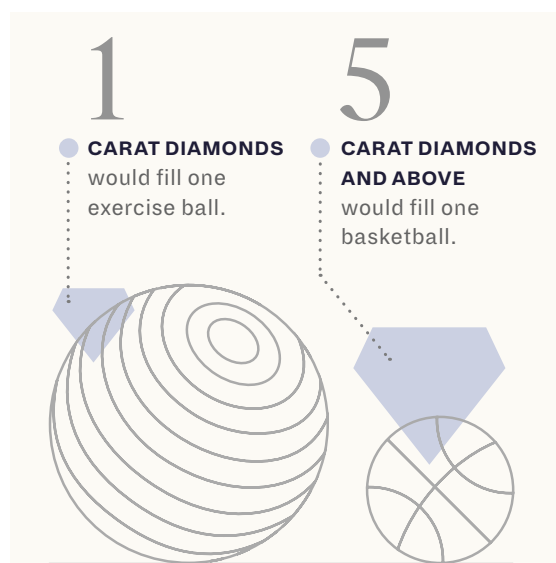
## FACTCHECK:

Natural diamonds are a finite resource. Global natural diamond recovery peaked in 2005, when rough diamond production was around 30% higher than in 2022<sup>105</sup>. The annual recovery of 1 carat diamonds is equivalent in volume to filling an exercise ball.

The process of natural diamond formation means that as an object, they are innately rare. Formation takes place across the span of millions, sometimes billions, of years and occurs in limited zones of the Earth's mantle at extreme temperatures and pressures<sup>106</sup>.

Natural diamonds are hard to find and have only been found in rock over the last 150 years. The first diamonds were found in caves in India nearly 4000 years ago and for a long time, this was the only known source. Over time, they have become prized for their perfect shape, hardness, rarity, fire resistance and intense light<sup>107</sup>.

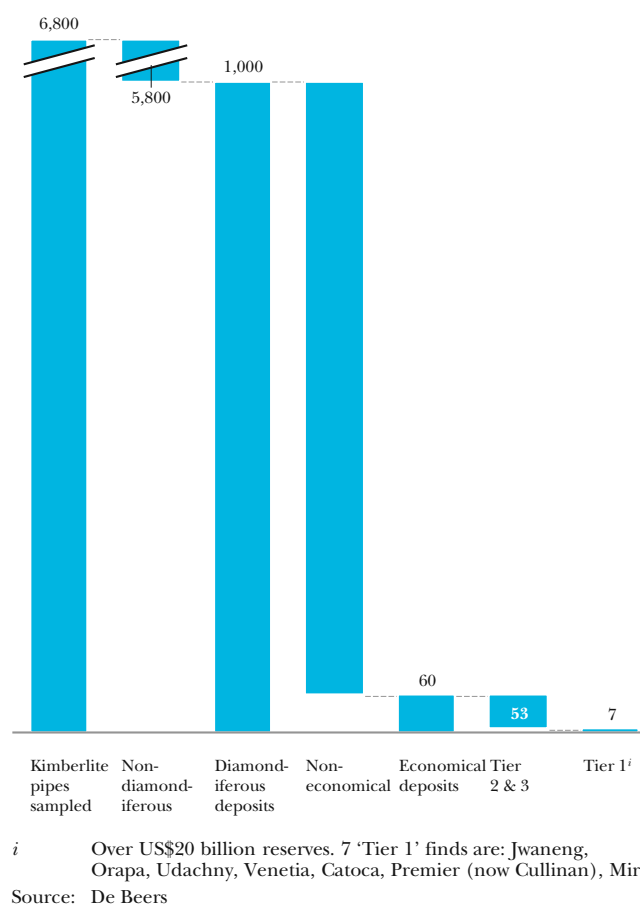
These conditions contribute to their rarity, with the annual recovery of 5 carat diamonds and above would fit into a basketball<sup>108</sup>.



In fact, today there are only 30 significant natural diamond mines in production, with only 7 mines considered to be classified as Tier 1 deposits. Tier 1 deposits are those which have over US\$20 billion in reserve<sup>109</sup>.

De Beers Group recorded that over the last 140 years, almost 7,000 kimberlite pipes have been sampled by geologists. Yet, approximately only 60 of these were deemed to be sufficiently rich in natural diamonds to be economically viable for large-scale diamond mining companies<sup>110</sup>.

FIG. 31: NUMBER OF DIAMOND DEPOSITS SUFFICIENTLY RICH TO WARRANT DEVELOPMENT



Source: Number of diamond deposits sufficiently rich to warrant development - De Beers Group 2014 Diamond Insight Report<sup>111</sup>

<sup>105</sup>Kimberley Process Statistics (n.d.) Public statistics. Available at: [https://kimberleyprocessstatistics.org/public\\_statistics](https://kimberleyprocessstatistics.org/public_statistics)

<sup>106</sup>Geology (n.d.) How do diamonds form? Available at: <https://geology.com/articles/diamonds-from-coal/#:~:text=may%20contain%20diamonds.,1%20Diamond%20Formation%20in%20Earth%27s%20Mantle,by%20deep%20source%20volcanic%20eruptions>

<sup>107</sup>Natural Diamond Council (2023) A brief history of natural diamonds. Available at: <https://www.naturaldiamonds.com/epic-diamonds/history/the-diamond-story/>

<sup>108</sup>Natural Diamond Council (2021) Beyond the 4 C's. Available at: <https://www.naturaldiamondcouncil-academy.com/sites/default/files/2021-08/BEYOND%20THE%204C.pdf>

<sup>109</sup>Petra Diamonds (n.d.) Industry overview. Available at: <https://www.petradiamonds.com/our-industry/industry-overview/>

<sup>110</sup>De Beers Group (2014) The diamond insight report 2014. Available at: <http://insightreport.debeersgroup.com/>

<sup>111</sup>Ibid

Many industry experts and analysts believe that the annual recovery of natural diamonds peaked in 2005 at 177 million carats<sup>112</sup>. Though this recovery has fluctuated, leading analyst Paul Zimnisky notes depleting legacy mines and limited new supply sources, further punctuated by the Covid-19 pandemic, resulted in a significant production decline. Through his analysis, it is predicted that production is expected to remain within a range of 115-125 million carats annually, a much lower figure than 150 million carats recorded in 2017<sup>113</sup>.

A major contributing factor to this belief is the declining profile of existing mines and the small success rate of exploration. Petra Diamonds states that the success rate in diamond exploration is estimated at less than 1%<sup>114</sup>.

Data recorded via the Kimberley Process from 2014 – 2021 illustrates the gradual decline of rough diamonds recovered and traded under the Kimberley Process Certification Scheme (KPCS) over recent times.

Deep pockets and large financial investment are needed to explore new diamond mining opportunities.

Determining the economic viability of these projects also extends to different types of mining, including alluvial mining. Alluvial mining is a process where stones are found in riverbeds or shorelines after kimberlites have eroded over time. Approximately 10-15% of the world's diamonds originate from alluvial mining, however, geologists have commented that often they cannot tell how many stones there are. This is a key piece of information in determining if reserves justify economic investment<sup>115</sup>.

The closure of mines which have reached the end of their economic lives include Argyle in Australia, owned by Rio Tinto which closed in November 2020, Victor Mine in Canada owned by De Beers Group which closed in 2019, Voorspoed in South Africa, owned by De Beers Group and Snap Lake, owned by De Beers Group in Canada<sup>116</sup>.

The termination of operations of mines like Argyle, which once produced up to 40 million carats a year is symbolic of the changing landscape of natural diamond mining<sup>117</sup>.

Further potential near-term closures include Diavik, Ekati, Nyurbinskaya and Almazy-Anabara which are expected to either reach economic depletion or conclude conventional mining by the end of this decade.

In fact, industry analyst Zimnisky notes that these mines currently account for a combined 17-20 million carats of annual production, representing approximately 15% of global supply<sup>118</sup>. This represents a significant supply change to the natural diamond industry. De Beers Group is also still exploring new opportunities and in 2022 signed Mineral Investment contracts with Angola to return to exploring the country for new sources<sup>119</sup>.

<sup>112</sup>Petra Diamonds (n.d.) Industry overview. Available at: <https://www.petradiamonds.com/our-industry/industry-overview/>

<sup>113</sup>Paul Zimnisky (2023) State of the diamond market February 2023. Available at: <https://www.paulzimnisky.com/state-of-the-diamond-market-past-issue-index>

<sup>114</sup>Petra Diamonds (n.d.) Industry overview. Available at: <https://www.petradiamonds.com/our-industry/industry-overview/>

<sup>115</sup>Ibid.

<sup>116</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>117</sup>JCK Online (2020) The Argyle diamond mine is shutting down. Available at: <https://www.jckonline.com/editorial-article/argyle-diamond-mine-shutting/>

<sup>118</sup>Paul Zimnisky (2023) State of the diamond market February 2023. Available at: <https://www.paulzimnisky.com/state-of-the-diamond-market-past-issue-index>

<sup>119</sup>De Beers Group (2022) De Beers group signs mineral investment contracts with Angola. Available at: <https://www.debeersgroup.com/media/company-news/2022/de-beers-group-signs-mineral-investment-contracts-with-angola>

# Is the industry *stockpiling* diamonds to drive-up prices?

## FACTCHECK:

Inventories of natural diamond producers fluctuate across periods of time, especially when they are broken down by size or quality of stones. This is because, unlike other industries, natural diamond producers cannot operate a just-in-time production model to match supply with demand.

Inventories are also impacted by seasonal demand patterns and by external events such as the global coronavirus pandemic.

Comparisons of production and sales data for NDC member companies shows that over a business cycle, there is no evidence of deliberate stockpiling to systematically drive-up prices. This is because total production and total sales are in line with one another. Bain & Company compiled data from company reports and the Kimberley Certification process to estimate that upstream inventories (i.e. those at diamond mine sites and sorting offices) across the world fell by 40% in 2021, leaving them close to minimal 'technical levels'<sup>120</sup>.

## The factors impacting diamond inventories

There are multiple factors that cause diamond inventory levels to fluctuate over time.

Firstly, unlike other industries, there is a large variance in the size, color and quality profile of what diamonds are recovered each month. These characteristics are dependent on natural geological processes, rather than manufacturing decisions. It also takes several weeks and months for recovered diamonds to travel from mine to a point of sale.

This is because they must be sorted, typically into one of 15,000 categories of rough diamonds according to their size, shape and quality, before being sold or auctioned at sales that are typically held once a month<sup>121</sup>. Inventories therefore fluctuate particularly by type of stone.

Seasonal fluctuations in demand can also affect monthly diamond inventories. For example, consumer demand for jewelry is usually highest in the fourth quarter of the year, around seasonal holidays, which can impact the inventory upstream.

Additionally, external events like the global coronavirus pandemic in 2020 or the Financial Crisis of 2008 can cause a reduce in demand and therefore, impact inventories following such events when economies start to recover<sup>122</sup>.



<sup>120</sup>Bain & Company (2022) The global diamond industry 2021 – 2022. Available at: <https://www.bain.com/insights/a-brilliant-recovery-shapes-up-the-global-diamond-industry-2021-to-22>

<sup>121</sup>The Israeli Diamond Industry (n.d.) Diamond sorting. Available at: <https://en.israelidiamond.co.il/wikidiamond/terms-attributes-the-diamond/diamond-sorting/>

<sup>122</sup>Bain & Company (2022) The global diamond industry 2021 – 2022. Available at: <https://www.bain.com/insights/a-brilliant-recovery-shapes-up-the-global-diamond-industry-2021-to-22>

## Recent trends

So, what has happened to diamond producer inventories in recent times? As explored in the chapter on rarity, natural diamonds are a finite resource and their recovery peaked in 2005 following the closure of legacy mines and finding new deposits<sup>123</sup>. Production in 2021 was recorded to be 20% below the level of 2017<sup>124</sup>.

Supply depletion, alongside the strong market demand of 2021 as the world emerged from the pandemic has reduced the inventory of mining companies to low levels<sup>125</sup>.

Bain & Company compiled data from company reports and the Kimberley Certification process to estimate that upstream inventories (i.e. those at diamond mine sites and sorting offices) across the world fell by 40% in 2021, leaving them close to minimal 'technical levels'.

To review inventory trends, comparisons of published carat production and sales data over a business cycle can be assessed.

Whilst this does not provide a complete picture, when analyzed over a considerable time, it helps to demonstrate that total production and total sales are in line with one another and that therefore, there is no evidence of deliberate stockpiling to systematically drive-up prices.

According to Paul Zimnisky, upstream inventory levels remain at significantly low levels. Production data is available on companies' websites<sup>126</sup> and underlines how the industry is pursuing increased transparency when it comes to production and inventory management.

Through the UN and World Trade Organization mandated Kimberley Process Certification Scheme, explored in our chapter on ethical sourcing, international rough diamond trade is regulated and recorded. Data and statistics arising from the Kimberley Process indicate the levels of diamond recovery and paint a clear picture of the market's production.

## What have been the *price trends* for laboratory-grown diamonds?

### FACTCHECK:

Prices for laboratory-grown diamonds have fallen from 2016 to 2023. For example, in some cases the price of a 1 carat stone has fallen by over 70%. There is a widening price differential between

laboratory-grown diamonds and natural diamonds. Whilst the price of natural diamonds have also fluctuated over the last 35 years, on average, they have risen by 3% per annum.

### How has the pricing of laboratory-grown diamonds changed over time?

Diamonds were first synthesized in a laboratory in the 1950s and the first synthetic gem-quality stones appeared on the market in the 1970s. In these early years, the stones were mostly small, and yellow or brown in color<sup>127</sup> and production costs were high<sup>128</sup>.

Since the commercial development of CVD technology in the early 2000s, production costs of laboratory-grown diamonds have fallen dramatically in line with technological advances, economies of scale and competitive pressures as new producers have entered the market.

<sup>123</sup>Kimberley Process Statistics (n.d.) Public statistics. Available at: [https://kimberleyprocessstatistics.org/public\\_statistics](https://kimberleyprocessstatistics.org/public_statistics)

<sup>124</sup>Ibid.

<sup>125</sup>Bain & Company (2022) The global diamond industry 2021 – 2022. Available at: <https://www.bain.com/insights/a-brilliant-recovery-shapes-up-the-global-diamond-industry-2021-to-22>

<sup>126</sup>De Beers Group (n.d.) Production reports. Available at: <https://www.debeersgroup.com/reports/production-reports>

Additionally, machines that were previously used to make industrial diamonds have been repurposed for gems. Bain & Company estimated that in the 10 years from 2008 and 2018, the average production costs of a high-quality laboratory-grown 1 carat stone fell by 90%<sup>129</sup>. Retail prices of laboratory-grown diamonds have also declined, though to a smaller extent. When laboratory-grown diamonds began appearing in commercial quantities in the jewelry market around 8 years ago, prices were typically slightly cheaper than those of natural diamonds.

However, as the laboratory-grown market has expanded, the relationship has diverged. For example, analyst Paul Zimnisky has noted that in 2016, a 1 carat round, almost colorless, high quality synthetic stone cost around 10% less than a natural diamond. However by the close of 2022, the differential was as much as 80%, depending on the manufacturer. Zimnisky's figures illustrate that a typical, generic, 1 carat laboratory-grown stone of this color and clarity was more than 70% cheaper than a natural diamond at the end of 2022.

### Sample prices of man-made relative to natural over 7 years

	Q4'16	Q4'17	Q4'18	Q4'19	Q4'20	Q4'21	Q4'22	Q1'23
0.5 CARAT								
MAN-MADE	\$1,305	\$1,170	\$875	\$700	\$585	\$640	\$555	\$580
NATURAL	\$1,490	\$1,425	\$1,500	\$1,260	\$1,430	\$1,390	\$1,235	\$1,255
0.5 CARAT								
MAN-MADE	\$5,250	\$4,515	\$3,675	\$2,700	\$1,945	\$1,745	\$1,485	\$1,435
NATURAL	\$6,200	\$5,925	\$6,325	\$5,626	\$5,850	\$6,215	\$5,620	\$5,635
0.5 CARAT								
MAN-MADE	\$10,600	\$8,450	\$6,550	\$4,985	\$3,740	\$3,370	\$2,785	\$2,445
NATURAL	\$12,125	\$12,050	\$12,750	\$12,325	\$12,375	\$14,225	\$13,925	\$13,625
0.5 CARAT								
MAN-MADE	N/A	N/A	N/A	N/A	\$19,950	\$13,580	\$11,095	\$9,065

Source: Paul Zimnisky (2023) State of the diamond market March 2023. Available at: <https://www.paulzimnisky.com/state-of-the-diamond-market-past-issue-index>

<sup>127</sup>GIA (n.d.) What are laboratory-grown diamonds. Available at: <https://4cs.gia.edu/en-us/laboratory-grown-diamond/>

<sup>128</sup>IGS (n.d.) A brief history of laboratory-grown diamonds. Available at: <https://www.gemsociety.org/article/brief-history-of-lab-grown-diamonds/>

<sup>129</sup>Bain & Company (2018) The global diamond industry. Available at: [https://www.bain.com/contentassets/a53a9fa8bf5247a3b7bb0b10561510c2/bain\\_diamond\\_report\\_2018.pdf](https://www.bain.com/contentassets/a53a9fa8bf5247a3b7bb0b10561510c2/bain_diamond_report_2018.pdf)

## How the prices of natural diamonds and laboratory-grown diamonds have changed from 2016 – 2023

Prices for laboratory-grown diamonds have fallen from 2016 to 2023, in some cases, for example for the price of a 1 carat stone, by over 70%. In 2016, a 1.5 carat natural diamond would have cost \$12,125 versus a 1.5 carat synthetic priced at \$10,600, amounting to the difference of \$1525. However, early 2023, the retail price of a 1.5 carat natural diamond had increased to \$13,625, whilst the laboratory-grown counterpart would have decreased in price to stand at \$2445, representing a substantially larger difference of \$11,180.

Research conducted by The Gem Academy illuminates the difference<sup>132</sup>. By analyzing 2021 price data for natural diamonds and laboratory-grown diamonds available from two online retailers, they recorded that the cost of a 1 carat natural diamond was \$7355 versus a 1 carat laboratory-grown diamond which stood at \$2110 representing a price difference of -71%. Across diamonds ranging from 0.5-3 carat weight, their research stated there was an average price difference of -66% across all sizes<sup>133</sup>.

## The current pricing of natural diamonds

Natural diamond prices reflect their rarity and limited supply. Bain & Company conducted a historical analysis in 2019, looking at data between 1970 and 2019, in which they noted that polished prices of natural diamonds had risen over the last 35 years on average by 3% per annum<sup>134</sup>. Post-pandemic, Bain & Company noted that in 2021, rough natural diamond prices grew by 21% and that prices increased by 9% year on year for polished diamonds. Whilst this is below their historic maximums, it illustrated that both rough and polished prices were returning to pre-pandemic levels<sup>135</sup>. Analyst Paul Zimnisky has tracked prices of rough diamonds since 2007. Based on an initial index value set at 100 on 31 December, 2007, his rough price index stood at 183.4 at the end of March 2023, implying an average annual growth trend of 4% per annum<sup>136</sup>.

## The differences in pricing structures between laboratory-grown diamonds and natural diamonds

In addition to the diverging price trends over time, there is also a difference in the pricing structures of laboratory-grown diamonds and natural diamonds. The supply, size and the quality mix available of natural diamonds depends completely on geology, and as noted in previous chapters, large stones are very rare. The prices of different types of natural diamonds have therefore always reflected this rarity. For example, this means that a 2 carat stone costs significantly more than double the price of a one carat stone. As a laboratory-grown diamond is not dependent on geology, the main constraint is the production capacity of each company. A larger synthetic stone requires more energy and takes longer to produce than a smaller one but the relationship is broadly linear – the production costs for a two carat stone are twice that of a one carat stone.

Whilst prices of natural and laboratory-grown diamonds have diverged, the differences have not been uniform across all sizes and qualities. They have tended to be highest for larger stones. For example, Zimnisky's data indicates that between the end of 2020 and the end of 2022, prices of 1 carat synthetic stones fell by 24% while prices of 3 carat stones fell by 45%.

Economic policies and geopolitical factors influence the price differential between natural and laboratory-grown diamonds. OECD has recorded that many countries are in a highly competitive race to attract diamond trading with nations offering tax exemptions or special economic zones for activities like cutting and polishing<sup>137</sup>. To stimulate the production of laboratory-grown diamonds at a significant scale India has implemented new policies to position itself as a competitive marketplace. For example, there has been a recent push by the Indian government to reduce import duties on diamond seeds, an essential component of lab grown diamonds, originating from China. In the latest 2023 Budget, the Union Finance Minister Nirmala Sitharaman abolished a 5% customs duty on imports of seeds used for the manufacturing of rough laboratory-grown diamonds<sup>138</sup>.

<sup>132</sup>The Gem Academy (2021) How much cheaper are laboratory-grown diamonds? Available at: <https://www.thegemacademy.com/post/how-much-cheaper-are-laboratory-grown-diamonds>

<sup>133</sup>Ibid

<sup>134</sup>Bain & Company (2019) The Global Diamond Industry 2019. Available at: [https://www.bain.com/globalassets/noindex/2019/bain\\_report\\_global\\_diamond\\_report\\_2019.pdf](https://www.bain.com/globalassets/noindex/2019/bain_report_global_diamond_report_2019.pdf)

<sup>135</sup>Bain & Company (2022) The global diamond industry 2021 – 2022. Available at: <https://www.bain.com/insights/a-brilliant-recovery-shapes-up-the-global-diamond-industry-2021-to-22/>

<sup>136</sup>Zimnisky (n.d) Rough Diamond Index <https://www.paulzimnisky.com/roughdiamondindex>

<sup>137</sup>OECD (2016) The challenges faced by developing countries in valuing rough diamonds. Available at: <https://www.oecd.org/dev/Session-6B%20-Case-study-on-mineral-product-pricing-rough-diamonds.pdf>

<sup>138</sup>The Hindu Businessline (2023) What are laboratory-grown diamonds? Can they substitute natural diamonds? <https://www.thehindubusinessline.com/blexplainer/bl-explainer-what-are-laboratory-grown-diamonds-can-they-substitute-natural-diamonds/article66476547.ece>

# Do natural diamonds *benefit* the *countries* where they come from?

## FACTCHECK

Members of the Natural Diamond Council are dedicated to reinvesting and creating a positive multiplier effect across the communities they work with, in line with their commitments to the UN Sustainable Development Goals, especially on areas surrounding alleviating poverty, decent work, health and wellbeing, fair wages as well as reduced inequalities. Up to 80% of rough diamond value can remain with local communities in the form of local purchasing, employment benefits, social programs, investment in infrastructure as well as the taxes, royalties and dividends paid from the industry to respective governments<sup>139</sup>.

Perceptions about economic inequalities across the natural diamond supply chain are outdated and tainted by a history of power imbalances.

Now, this is no longer the case. The natural diamond industry has generated significant economic contributions to many developing nations, diamond producing countries. This has created a positive multiplier effect for countries like Botswana and Namibia. The flourishing of these economies fights the paradox of the 'resource curse'.

The natural diamond industry is often perceived as a mining industry that does not take care of the regions from which it extracts minerals and diamonds, for the benefit of organizations in the West. Perceptions about legacy issues of colonialism and corruption of large scale diamond miners are often outdated. These companies are heavily regulated and are genuinely invested in the economic and social prosperity of the communities it has worked with for centuries.

## Enriching the lives of diamond mining communities

The natural diamond industry supports the livelihoods of 10 million people across the world involved in the diamond supply chain<sup>140</sup>.

It is important to note, that many of the mining companies are partially owned by the local governments, which means they take a direct part of the economic benefits and impact the strategic direction of the mining operations. This includes De Beers Group's operations in Namibia and Botswana.

NDC member companies make a significant socio-economic contribution to the local communities and governments where they operate. This can be in the form of local employment and training, local sourcing of products and services as well as health and education programs and training for local suppliers and businesses, through investment in infrastructure. They aim to ensure that local communities share in the success of the mine whilst it is in operation and also prepare for their future after mine closure.



<sup>139</sup>Reuters (2017) De Beers Group Namibia launch world's biggest diamond exploration ship. Available at: <https://www.reuters.com/article/us-anglo-american-debeers-namibia-idUSKBN1961HS>

<sup>140</sup>Natural Diamond Council (2022) How buying sustainable natural diamonds leaves a positive impact. Available at: <https://www.naturaldiamonds.com/diamond-guide/reasons-to-buy-sustainable-natural-diamonds/>

Table 3 - Summary of socio-economic benefits of NDC members<sup>141</sup>

EMPLOYMENT AND TRAINING	99.7% of NDC member employees are from the countries where mines are located.
LOCAL SOURCING OF PRODUCTS AND SERVICES	ERM estimated that 85% of all procurement by NDC members is made in-country.
TRAINING FOR LOCAL SUPPLIERS AND BUSINESSES	NDC members run programs to support economic development and job creation by mentoring local entrepreneurs to develop the skills needed to build successful businesses and by providing access to markets. Examples include the Tokafala and Zimele programs.
SOCIAL INVESTMENT PROGRAMS	To assist with provision of key services such as housing, water, digital connectivity, healthcare, education and skills support for children and adults and agricultural initiatives to support food security and transform rehabilitated mining land into productive agricultural land.
INVESTMENTS IN LOCAL INFRASTRUCTURE	For roads, schools, hospitals, water and energy supply and local sports/culture
TAXES AND ROYALTIES	Payroll, profit, taxes and royalties paid by diamond miners are a significant positive economic contribution for host governments (35% of fiscal revenue in Botswana in 2021). All NDC members report publicly either via their sustainability reports, financial reports or tax and economic contribution reports.

Research conducted by sustainability consultancy ERM determined based on 2019 and 2020 data that countries who host mining operations gain significant opportunities for development and industrialization, especially in regard to the purchasing of goods and services within a given region which prevents a leak in investment and procurement being transferred elsewhere. It recorded that the total procurement spend by NDC member companies in these countries exceeded spend on wages, taxes and royalties and community investment combined<sup>142</sup>.

It was also reported that approximately \$3.2 billion was spent in with local suppliers, defined as those within the country of operation, representing over 85% of all procurement spend<sup>143</sup>. These figures indicate how serious the natural diamond industry is about ensuring their operations benefit communities of host mining countries. In 2019, it was also recorded that they have made a total economic contribution of at least \$9.64 billion to local communities<sup>144</sup>.

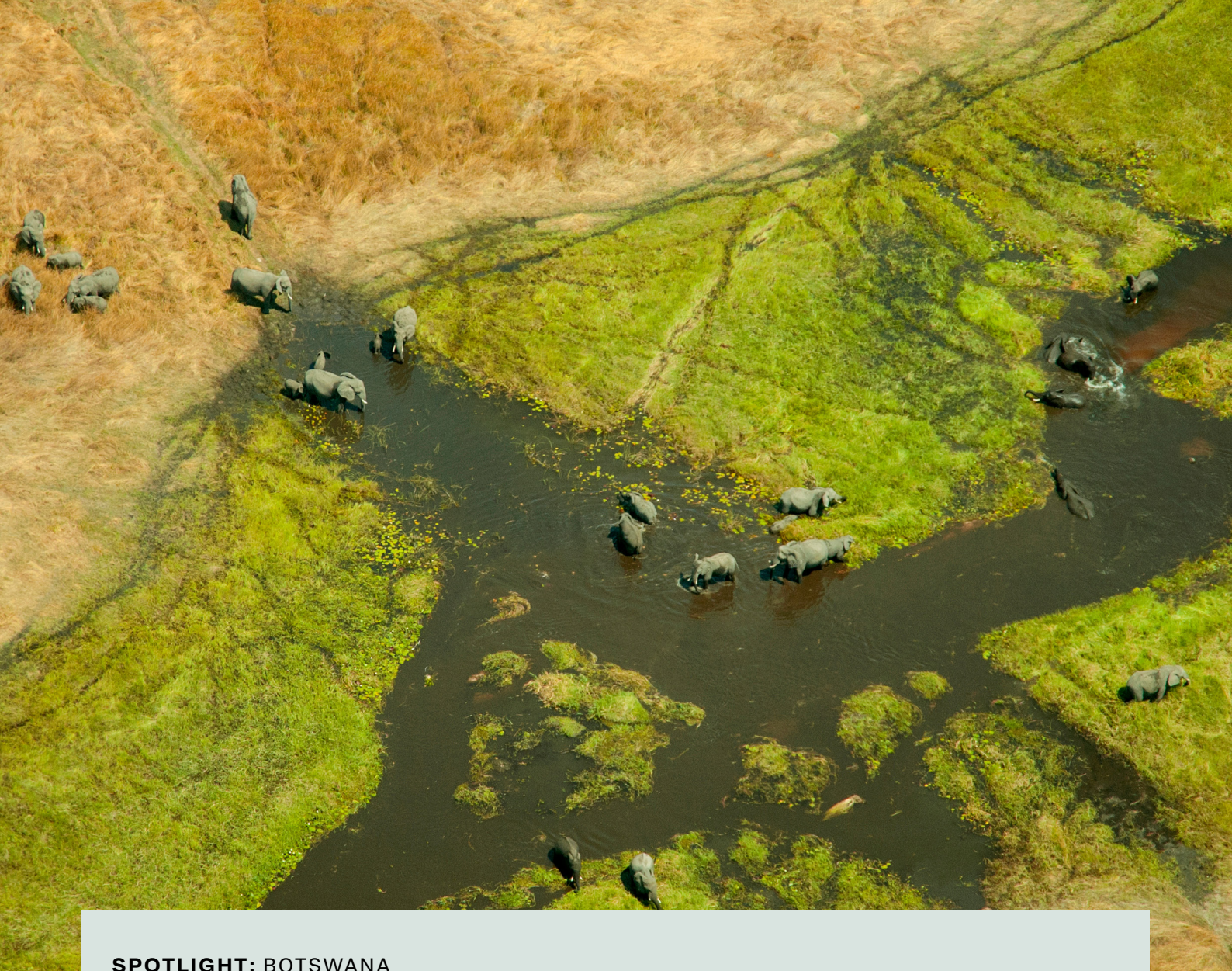


<sup>141</sup> ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>142</sup> Ibid.

<sup>143</sup> ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>144</sup> Ibid.



## SPOTLIGHT: BOTSWANA

The southern African nation of Botswana illustrates the power the natural diamond industry has to uplift communities and create a positive socioeconomic impact. Diamonds represent 88% of total exports of Botswana and the industry currently contributes around 35% of income to fiscal revenue<sup>145</sup> and 33% of Botswana's GDP in 2021<sup>146</sup>. The development of the industry has helped Botswana avoid the resource curse and supports employment and growth in the economy through a focus on local procurement and development programs for SMEs such as the Tokafala and Zimele program, alongside investments in capital works and infrastructure<sup>147</sup>.

Revenue from diamond sales to the government is generated by income tax, royalties, and a share of the company's profits as dividends from Debswana, its 50/50 joint venture with De Beers Group<sup>148</sup>.

Debswana has existed for over 50 years and the venture held between the Government and De Beers means that it sells 75% of its output to De Beers Group, while 25% goes to the state-owned Okavango Diamond Company<sup>149</sup>. De Beers is 15% owned by Botswana and the Diamond Trading Company Botswana (DTCB) is 50% owned by the Government of Botswana. The World Bank has reported that the arrangement which enables the Government to generate revenue from diamond mining is approximately 80 cents of every dollar of profits generated by Debswana<sup>150</sup>. Activities like this have contributed to a rise in prosperity and per capita income, which following independence in 1967 stood at around \$80 a year but in 2008 reached \$6000 a year<sup>151</sup>. Revenue from natural diamonds contributes to a school system providing free primary education to every Botswanan child.

<sup>145</sup>The Sparklr (n.d.) Positive impact of diamonds on producing countries. Available at: <https://www.thesparklr.com/learn/positive-impact-diamonds-producing-countries>

<sup>146</sup>PR Week (2022) Natural Diamond Council global ambassador Lily James visits Botswana. Available at: <https://www.prnewswire.com/news-releases/natural-diamond-council-global-ambassador-lily-james-visits-botswana-301659963.html>

<sup>147</sup>Trucost (2019) The socio-economic and environmental impact of large-scale diamond mining. Available at: [https://www.spglobal.com/marketintelligence/en/documents/the-socioeconomic-and-environmental-impact-of-large-scale-diamond-mining\\_dpa\\_02-may-2019.pdf](https://www.spglobal.com/marketintelligence/en/documents/the-socioeconomic-and-environmental-impact-of-large-scale-diamond-mining_dpa_02-may-2019.pdf)

<sup>148</sup>World Bank (n.d.) Small countries with volatile revenue: Botswana and Bhutan. Available at: <https://documents1.worldbank.org/curated/en/413221467997599192/pdf/98089-WP-Small-states-with-volatile-revenue-flows-Box391504B-PUBLIC.pdf>

<sup>149</sup>Reuters (2023) De Beers Group confident talks will deliver Botswana diamond deal. Available at: <https://www.reuters.com/markets/commodities/de-beers-confident-talks-will-deliver-botswana-diamond-deal-2023-02-16/>

<sup>150</sup>World Bank (n.d.) Small countries with volatile revenue: Botswana and Bhutan. Available at: <https://documents1.worldbank.org/curated/en/413221467997599192/pdf/98089-WP-Small-states-with-volatile-revenue-flows-Box391504B-PUBLIC.pdf>

<sup>151</sup>New York Times (2008) Diamonds are forever in Botswana. Available at: <https://www.nytimes.com/2008/08/09/business/worldbusiness/09nocera.html>

Namibia neighbors Botswana and also demonstrates how positive socioeconomic returns can arise from the natural diamond industry. Diamonds generate 20% of Namibia's foreign export earnings and it receives 80 cents of every Namibian dollar generated by De Beers Namibia, its 50:50 joint venture with De Beers Group<sup>152</sup>. According to the World Bank, the adoption of new marine mining technologies for diamonds in Namibia in 2004 led to an increase in production and helped the economy achieve historically high growth of 12.3%. As of 2021, diamonds remain Namibia's most important product in the mining sector, accounting for close to 68% of mineral output and 45% of foreign exchange earnings<sup>153</sup>.

It is not only regions in Africa that stand to benefit from the natural diamond mining. It is a foundational industry for the Northwest Territories (NWT) in Canada where it is the largest private sector industry and contributed 24% of total GDP in 2020<sup>154</sup>. Data from the 2021 Government of the Northwest Territories Socio-economic Agreement Report for Mines operating in the NWT recounts how the mining industry contributes to construction, transportation, retail and real estate, alongside the direct benefit of wages and that in 2021. Since 1996, NWT diamond mines have provided 32,137 person years of employment cumulatively and contributed over \$24 billion to the economy. Of this, nearly \$17 billion went toward NWT businesses and \$7.5 billion to Indigenous-owned NWT businesses<sup>155</sup>.



## The impact of contributions from Natural Diamond Council members

Members of the Natural Diamond Council are dedicated to reinvesting and creating a positive multiplier effect across the communities they work with in line with their commitments to the UN Sustainable Development Goals, especially on areas surrounding alleviating poverty, decent work, health and wellbeing, fair wages as well as reduced inequalities.

According to an ERM report NDC members paid close to \$2 billion directly in salaries and benefits in 2019<sup>156</sup>.

Commitment to societal impact is underlined by the fact that NDC members invested over \$165 million in social programs in 2019 which focused on community development initiatives related to agriculture, enterprise development, education and skills development, healthcare, and infrastructure<sup>158</sup>.

There are over 150 social and infrastructure investment and philanthropy initiatives that take place across an array of areas including agriculture, enterprise development, education and skills development as well as healthcare, sports, arts and culture. These activities generate \$16 billion net profit annually.

Mining companies' response during Covid-19 highlights their dedication to support communities. For example, during the pandemic, De Beers Group was active in Botswana and provided 24 clinics with Personal Protection Equipment (PPE), accommodation for medical personnel, food parcels for vulnerable households, water relief for local communities, 250,000 face masks from local SMEs, remote support for entrepreneurs, 20,000 liters of sanitizer produced in partnership, \$50,000 to tackle GBV and a PCR test machine for a hospital<sup>159</sup>.

<sup>152</sup>Reuters (2017) De Beers Group Namibia launch world's biggest diamond exploration ship. Available at: <https://www.reuters.com/article/us-anglo-american-debeers-namibia-idUSKBN1961HS>

<sup>153</sup>World Bank Group (2021) Namibia systematic country diagnostic. Available at: <https://documents1.worldbank.org/curated/en/976371617896981427/pdf/Namibia-Systematic-Country-Diagnostics.pdf>

<sup>154</sup>Natural Diamond Council (2022) How the natural diamond industry supports Canada's last frontier. Available at: <https://www.naturaldiamonds.com/industry-insights/canada-diamond-mines-community-impact/>

<sup>155</sup>Ibid.

<sup>156</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>157</sup>Ibid.

<sup>158</sup>Ibid.

<sup>159</sup>Ibid.

### **SPOTLIGHT: DE BEERS GROUP HIV DISEASE MANAGEMENT PROGRAM**

Natural diamond revenue is helping African nations work to combat HIV/AIDs. The De Beers Group HIV Disease Management Program was launched by Debswana in 2001 with the Government of Botswana. It was a first of its kind initiative aimed to tackle HIV and prevent, detect and treat HIV and AIDs and offers free antiretroviral treatment to employees and their families. De Beers Group recorded that 89% of employees knew their HIV status in 2018 compared with 26% in 2015, and that the uptake of HIV treatment has risen from 90% to 95%<sup>160</sup>. In 2020, they marked more than 11 years of no babies being born with HIV to De Beers Group employees or their spouses<sup>161</sup>.

### **SPOTLIGHT: DIAMONDS DO GOOD**

Diamonds Do Good, formerly the Diamond Empowerment Fund, is a global non-profit that works to support initiatives that empower people and their development in diamond communities. It supports beneficiaries in Africa and India including the African Leadership Academy in South Africa; Botswana Top Achievers Program in Botswana, The Diamond Development Initiative in the Democratic Republic of Congo (DRC), the Flaviana Matata Foundation in Tanzania and Veerayatan's Colleges of Pharmacy, Engineering & Business Administration, in India<sup>162</sup>. They aim to fund programs and provide grants that focus on high-quality education for younger generations<sup>163</sup>.

### **SPOTLIGHT: DEVELOPMENT DIAMOND INITIATIVES**

Based in Nigeria, the Diamond Development Initiatives is a non-profit that works with an ecosystem of businesses, government and social services to encourage development and growth in businesses involved in diamond mining and promote sustainable and social impact.

In recent times, they have run projects like operating mobile schools in countries like the DRC to help students pass exams. Through their programs over 200,000 miners have been registered in the DRC, 10 miners' cooperatives have been formed and legalized, 121 children in mining communities have been given access to remedial education, 13 mining operations have been certified compliant to the Maendeleo Diamond Standards in Sierra Leone, and several previously mined sites have been environmentally rehabilitated<sup>164</sup>.

#### **The DDI's work with Resolve**

In 2020, the DDI joined forces with non-governmental organization RESOLVE to focus on responsible sourcing of artisanal diamonds by looking at conflict resolution, poverty reduction and heightened levels of social due diligence. They created the Maendeleo Diamond standards which were the first set of standards for ethical artisanal diamond production and supply chain security<sup>165</sup>.

Their partnership work in Sierra Leone is focusing on land reclamation and restoration as well as reconciliation for communities affected by conflict. They are working to ensure responsible sourcing and help artisan diamond miners move away from poverty. The DDI has been supported by members of the NDC include De Beers Group and Rio Tinto, as well as retailers like Tiffany & Co and Cartier<sup>166</sup>.

<sup>160</sup>De Beers Group (n.d.) Our journey – Volume 3. Available at: <https://www.debeersgroup.com/~media/Files/D/DeBeers-Group-V2/documents/building-forever/our-journey/our-journey-vol-3.pdf>

<sup>161</sup>De Beers Group (n.d.) HIV & Aids prevention. Available at: <https://www.debeersgroup.com/sustainability-and-ethics/partnering-for-thriving-communities/hiv-and-aids-prevention>

<sup>162</sup>The Sparklr (n.d.) Positive impact of diamonds on producing countries. Available at: <https://www.thesparklr.com/learn/positive-impact-diamonds-producing-countries>

<sup>163</sup>Diamonds Do Good (n.d.) Who we help. Available at: <https://www.diamondsdogood.com/who-we-help/>

<sup>164</sup>The Sparklr (n.d.) Positive impact of diamonds on producing countries. Available at: <https://www.thesparklr.com/learn/positive-impact-diamonds-producing-countries>

<sup>165</sup>Resolve (n.d.) Diamond Development Initiatives. Available at: <https://www.resolve.ngo/ddi.htm>

# How are natural diamonds *ethically sourced*?

## FACTCHECK:



The industry is highly regulated. Under the Kimberley Process mandated by the United Nations and the World Trade Organization, all rough diamond trade is strictly regulated to ensure it is conflict-free. Multiple

initiatives, processes and policies ensure that the industry moves beyond compliance on social issues across the supply chain. There are a robust set of checks and balances, including audits of the largest industry players to enshrine the importance of ethical sourcing.

Ethical sourcing is essential to the practices of the natural diamond industry. It means that products and services across the supply chain are obtained in an ethical way. This includes upholding labor rights, decent working conditions, no child labor, the existence of health and safety measures and importantly, strong business ethics with respect for local communities<sup>166</sup>. In the context of diamond mining, this includes sourcing conflict-free diamonds.

For many years, the natural diamond industry has worked hard to reform and address legacy issues related to mining practices and conflict diamonds. Now, the whole sector is held to extremely high trading standards. This is in part because 85% of the world's diamonds by volume and 95% by value<sup>167</sup> are extracted and marketed by large mining companies that are public entities which are held to account by shareholders and stakeholders for their social and environmental impact.

Pressure for mine-to-market supply chain transparency and traceability of diamonds has contributed to building the importance of ethical sourcing for the natural diamond community.

Multiple pillars exist to ensure ethical sourcing and compliance across supply chains. **The Kimberley Process or Kimberley Process Certification Scheme (KPCS)** is a foundational block for the industry in achieving this. As a joint initiative between governments, diamond industry bodies and civil society. It is mandated by the United Nations and the World Trade Organization, to stem the flow of conflict diamonds.

Since it became operational in 2003, it has worked to ensure that only rough diamonds with KP certificates can be legally traded and that only KP compliant countries are able to operate in the international diamond trade. These countries must commit to transparency and exchange of statistical data, export and import controls, and only legally trade with other KP participants. It stipulates that all international shipments of rough diamonds must be accompanied by a certificate that guarantees they are conflict-free.

Now, over 80 countries participate in the process, and it has been recorded that conflict diamonds account for less than 1% of recorded rough diamond trade, a number that once stood at 4-15% in the 1990s.

Whilst the KPCS definition refers to conflict diamonds, the natural diamond industry has built on this to expand ethical sourcing beyond conflict free. To ensure human rights are protected it follows numerous other policies and frameworks.

<sup>166</sup>Sedex (n.d.) What does ethically sourced mean? Available at: <https://www.sedex.com/blog/what-does-ethically-sourced-mean/>

<sup>167</sup>Natural Diamond Council (n.d.) The framework for an ethical and sustainable diamond industry. Available at: <https://www.naturaldiamonds.com/industry-insights/the-framework-for-an-ethical-and-sustainable-diamond-industry/>

The industry's sourcing practices are held to account by legislation such as the Dodd-Frank Act in the United States which implies that any single company assumes its own direct ethical responsibility without transferring this issue to international organizations<sup>171</sup>. In this report's Traceability chapter, we touched on the importance of OECD Due Diligence Guidance, UK Modern Slavery Act, California Transparency in Supply Chains Act, the EU Conflict Mineral Regulation and the London Metal Exchange Responsible Sourcing initiative.

## Industry standards

The natural diamond industry has committed to measures that encompass social standards and business ethics. This includes codes of conduct, guidelines and third-party oversight measures, alongside in-house due diligence structures. These processes are continuously evolving as industry players proactively address social issues and work to protect human rights through ethical sourcing.

*A few examples include:*

## WORLD DIAMOND COUNCIL SYSTEM OF WARRANTIES

The System of Warranties (SoW) was developed in 2002, to address areas outside the KPCS.

It requires professional buyers and sellers of rough diamonds, polished diamonds and jewelry setters with diamonds to include a warranty statement on invoices and memos each time a diamond changes hand. This is with the objective of assuring the next buyer that it originated from sources in compliance with the KPCS and to confirm its conflict-free origin. The SoW includes responsible business practices related to human and labor rights as well as anti-money laundering and anti-corruption.

Warranty statements are made each time the diamond passes along the supply chain, not just at export and import stages. It has become challenging to do business without the SoW as it is demanded by associations, companies and countries like Belgium, where it is integrated into statutory auditing procedures.

Abiding by the SoW is a condition of membership to organizations like World Federation of Diamond Bourses (WDFB) International Diamond Manufacturers Association (IDMA), and the Responsible Jewellery Council (RJC).

The SoW guidelines support universally accepted principles of human and labor rights that prioritize ethical sourcing and references the UN Guiding Principles on Business and Human Rights, the ILO Declaration on Fundamental Principles and Rights at Work, the UN Convention Against Corruption, and national AML guidelines that comply with the FATF's 40 Recommendations on Money Laundering for Dealers in Precious Metals and Stones<sup>168</sup>.

Retailers abide by the SoW and it is cited by multiple jewelers including De Beers, Chow Tai Fook and Tiffany & Co in their supplier codes of conduct.



<sup>168</sup> World Diamond Council (2022) System of Warranties Factsheet. Available at: <https://www.worlddiamondcouncil.org/wp-content/uploads/2022/02/System-of-Warranties-Fact-Sheet.pdf>

## RESPONSIBLE JEWELLERY COUNCIL CODE OF PRACTICES

The RJC is a not-for-profit standards authority working to help the jewelry industry create a sustainable supply chain. The Code of Practices defines responsible ethical, human rights, social and environmental practices that certified members must adhere to. Members are upheld against the ISEAL Code of Good Practice for Setting Social and Environmental Standards too.

### SPOTLIGHT: DE BEERS GROUP

Companies in the industry like De Beers Group have introduced their own standards which are independently audited by third parties to ensure ethical sourcing. Their Best Practice Principles (BPPs) Assurance Program aims to guarantee that diamonds are not only conflict-free but that they abide by international human rights frameworks and labor regulations. The standards are applied throughout the De Beers Group value chain and over 2,600 entities which employ nearly 350,000 are subject to these standards<sup>170</sup>.

Another example is the De Beers Group Kalahari Dream venture. This organization sells natural diamonds directly to the consumer where they have been sourced directly from southern African mining companies like Debswana with high ethical standards. These diamonds have been manufactured and polished by local workshops which employ artisans and communities in Botswana and can guarantee that the highest social standards have been followed<sup>171</sup>.

The Code of Practices has thorough rulings on human rights due diligence, responsible sourcing in high-risk areas, labor rights on contracts, wages, health and safety, grievance procedures, child labor, forced labor, freedom of association and the right to collective bargaining<sup>169</sup>.

### SPOTLIGHT: GEMFAIR™

GemFair™ is a program that connects artisanal and small-scale miners to the global market through digital technology and the assurance of ethical working standards.

It was first piloted to create a secure and transport route to market for small-scale diamonds. With a digital record, each exporter parcel can be tracked via GemFair™ until it reaches its destination.

Not only does GemFair™ help to improve business and environmental practices, but it also ensures miners are paid fair value for their diamonds and provided with access to training<sup>172</sup>.

In 2019, GemFair™ operations were expanded in Sierra Leone to scale its positive impact and extend the benefit of the program and heightened traceability to more miners<sup>173</sup>.

<sup>169</sup>Responsible Jewellery Council (2019) Code of Practices. Available at: <https://www.responsiblejewellery.com/wp-content/uploads/RJC-COP-December-2019.pdf>

<sup>170</sup>De Beers Group (n.d.) Best practice principles assurance program. Available at: <https://www.debeersgroup.com/sustainability-and-ethics/leading-ethical-practices-across-the-industry/best-practice-principles-assurance-programme>

<sup>171</sup>Kalahari Dream (n.d.) Available at: <https://kalaharidream.com/>

<sup>172</sup>GemFair (n.d.) Available at: <https://gemfair.com/>

<sup>173</sup>Mining Technology (2019) De Beers Group expands GemFair pilot for ethically sourced diamonds. Available at: <https://www.mining-technology.com/news/company-news/de-beers-gemfair-diamonds/>

## What to consider when purchasing ethically sourced diamonds

It's important to ask the right questions and to know what to look for when purchasing a natural diamond to ensure it is ethically sourced.

*Here are a few of our tips:*

- **Ask your jeweler** if they have a certification or if they work with suppliers that have 3rd party certifications. This includes the Responsible Jewellery Council who help warrant ethical processes employed.
- **Ask that your retailer** or jeweler works with diamonds that abide by the Kimberley Process Certification Scheme (KPCS) if trading in rough diamonds.
- **Look for certification** and brand marks about their sourcing for example the Tiffany & Co provenance guarantee.
- **Research** whether the jeweler is a member of industry standards and initiatives<sup>174</sup>.
- **Review the brand's own policies** and see if they go beyond the KPCS.



<sup>174</sup>Time (2015) How to buy an ethical diamond. Available at: <https://time.com/4013735/how-to-buy-an-ethical-diamond/>

# What are the *working conditions* like in the natural diamond industry?

## FACTCHECK:

Members of the Natural Diamond Council ensure that working conditions related to fair pay, health and safety, employee benefits and protection of human rights are followed to the highest global standards within their mining operations. 99.7% of employees of NDC members are hired locally and according to data from 2021 were paid on average 64% more than the national average salary<sup>175</sup>.

Diamond recovery is mostly carried out by large-scale companies using modern equipment and mining practices. All NDC members have adopted the goal of zero-harm in the workplace. Workplace safety incidents recorded by NDC members are

significantly lower than in other industrial and mining sectors.

NDC members seek to build long-term partnerships with the people they employ. They seek to offer safe, high-quality jobs and fair working conditions for all their employees and contractors in terms of wages, working hours, non-discrimination, protection from harassment as well as the right to collective bargaining and the ability to follow grievance procedures<sup>176</sup>. One third, and growing, of the natural diamond mining industry workforce are women, and 30% of board members of NDC members are women.

## Employment benefits created by NDC members<sup>182</sup>

VALUING LOCAL PEOPLE	Priority is given to local employment with 99.7% of NDC member employees recruited from within the country of where mines operate. Where applicable, NDC members have public commitments to respect the rights, interests and traditions of local communities and Indigenous people.
COMPENSATING FAIRLY	All NDC members offer competitive wages to employees, typically significantly higher than the local labor market.
DEVELOPMENT THROUGH TRAINING	NDC members train and develop their employees to equip them with skills to contribute and better their career and to make a positive difference to their lives and communities. Each member also has targeted training programmes to accelerate equal opportunities for previously disadvantaged groups.
PRIORITISING HEALTH AND SAFETY	Health and safety is the core value at the heart of all operations with NDC members putting the health and safety of their employees and contractors ahead of any other consideration.
RESPECTING HUMAN RIGHTS	NDC members have clear human rights policies that adhere to all key global and national standards. Beyond that, they seek to promote human rights within the broader industry and to be a force for continuous improvement.
WOMEN ON BOARDS	30% of board members of NDC companies are women <sup>177</sup> . This surpasses the average for similar sized companies according to OECD, where only around 1 in 20 of the top 500 multinationals have female representation above 30% at a board level.

<sup>175</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>176</sup>ILO (n.d.) Working conditions. Available at: <https://www.ilo.org/global/topics/dw4sd/themes/working-conditions/lang-en/index.htm>

<sup>177</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

As explored in our chapter on ethical sourcing, the industry is highly regulated under trading and legal frameworks by the United Nations and World Trade Organization. Multiple initiatives, processes and policies ensure that the industry moves beyond compliance on social issues across the supply chain. Read more about ethical sourcing in the natural diamond industry here.

There is also adherence to the Responsible Jewellery Council's Code of Practices, the De Beers Group Best Practice Principles Assurance Program, the Petra Human Rights Policy and the Rio Tinto Human Rights Policy and Supplier Code of Conduct.

From the RJC specifically, their Chain-of-Custody Standard requires companies to establish documentary evidence of business transactions along the supply chain and to confirm they are not causing adverse impacts in conflict-affected and high-risk areas, this includes understanding more about the working conditions at each stage of production<sup>178</sup>. With a focus on miners in the supply chain, the Resolve and Diamond Development Initiative, Maendelo Diamond Standards and Initiative for Responsible Mining Alliance, amongst many others, are working to enshrine workers' rights on the ground.

The large-scale mining industry works to do this, not only to meet regulatory requirements but because they are deeply invested in the livelihoods of the millions of workers they employ.

*NDC members adhere to the highest labor standards shaped by the:*

- UN Guiding Principles on Human Rights
- International Labour Organisation
- GRI Sector Standard for Mining OECD Due Diligence Guidance for Responsible Supply Chains of Minerals
- OECD Due Diligence Guidance for Responsible Supply Chains of Minerals

## Health and safety

All NDC members have adopted the goal of zero-harm in the workplace.

Keeping employees safe is the responsibility of everyone on site. It requires a strong safety culture in which no shortcuts or compromises are acceptable if they could result in an injury. It also requires following strict rules and processes, wearing the appropriate protective equipment, analyzing every task for its safety risk before performing it and continuously training teams to employ safe behaviors.

At workplaces of NDC member companies, work shift starts with a safety review of the last shift and a discussion of risks associated with the next shift. Leaders engage continuously with their teams on the ground to coach, train and correct them. New technologies are continuously introduced, such as vehicle proximity detection equipment or geological movement monitoring devices. The safety performance of every operation is rigorously monitored and is a very important driver of a leader's performance evaluation. No leader with a poor safety record will be promoted<sup>179</sup>.

From De Beer's Good To Great Program, the Petra Mining Occupational Safety and Health initiative run in cooperation with the South African Chamber of Mines, and the Rio Tinto Critical Risk Management program, NDC members are focused on the health and safety of their workers at all times.

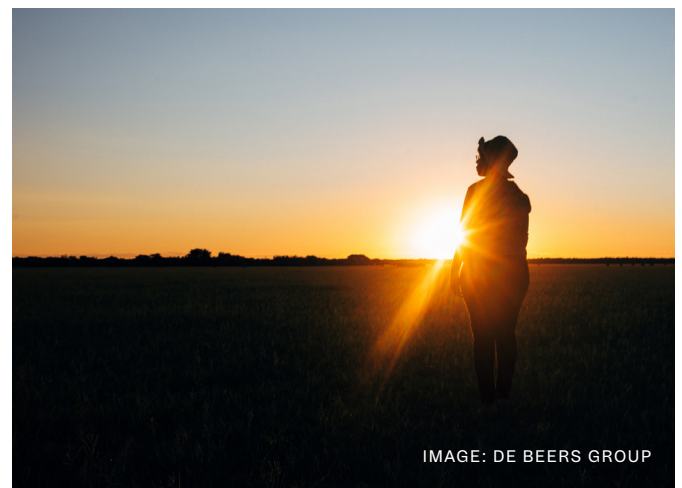


IMAGE: DE BEERS GROUP

<sup>178</sup> Responsible Jewellery (2017) Code of conduct. Available at: <https://www.responsiblejewellery.com/wp-content/uploads/RJC-CoC-2017-V2-Standard-Guidance-3-1.pdf>

<sup>179</sup> Natural Diamond Council (2022) World health day: How the natural diamond industry is building healthy communities. Available at: <https://www.naturaldiamonds.com/industry-insights/world-health-day-how-the-natural-diamond-industry-is-building-healthy-communities/>

## Gender diversity in the workplace

NDC members are focused on encouraging gender diversity at an executive level, as well as throughout the entire workforce. One third of the natural diamond industry (for mining) are women which can have a positive impact on their family's prosperity and inclusivity amongst communities<sup>180</sup>. From a corporate governance perspective, 30% of board members of NDC companies are women<sup>181</sup>.

This surpasses the average for similar sized companies as according to OECD, only around 1 in 20 of the Top 500 multinationals have female representation above 30% at a board level<sup>182</sup>. Rio Tinto provides an example as Angela Bigg was the first appointed female President and CEO of the Diavik Diamond Mine<sup>183</sup> and Kellie Parker is the Chief Executive for Australia<sup>184</sup>.

### SPOTLIGHT: LUCARA DIAMOND

The Globe and Mail's third benchmark of female leaders in Canada recognized Lucara Diamond as the second highest among 74 Canadian companies reported with 75% women corporate executives, including President and CEO, Eira Thomas, as well as Naseem Lahri, Managing Director, Lucara Botswana Proprietary Limited. NDC member Lucara highlights excellent labor practices. For the company's workers with a permanent

contract, they receive a housing allowance, medical aid subsidy, group life insurance, and statutory worker's compensation. They also have multiple national holiday days and instead of the statutory 25% of pay during maternity leave, the company pays 100% of wages for up to three children. Additionally, instead of a pension scheme, employees are paid a gratuity every three years<sup>185</sup>.



IMAGE: LUCARA BOTSWANA

<sup>180</sup>ERM (2022) Natural Diamond Council members sustainability overview. Internal research based on NDC members reports and audited data.

<sup>181</sup>Ibid.

<sup>182</sup>OECD (n.d.) What big data can tell us about women on boards. Available at: <https://www.oecd.org/gender/data/what-big-data-can-tell-us-about-women-on-boards.htm>

<sup>184</sup>Rio Tinto (2021) First female president appointed for Diavik Diamond Mine. Available at: <https://www.riotinto.com/en/news/releases/2021/first-female-president-appointed-for-diavik-diamond-mine>

<sup>185</sup>Rio Tinto (n.d.) Executive committee. Available at: <https://www.riotinto.com/en/about/executive-committee/kellie-parker>

<sup>186</sup>Lucara Diamond (2021) Sustainability report 2021. Available at: [https://lucaradiamond.com/site/assets/files/39356/2021\\_sustainabilityreport.pdf](https://lucaradiamond.com/site/assets/files/39356/2021_sustainabilityreport.pdf)

# Are natural diamonds *traceable*?

## FACTCHECK:

The natural diamond industry is accelerating its traceability initiatives and leveraging technology like blockchain to bring transparency to its supply chains. Historically, tracing raw materials and minerals for diamonds across the globe has been difficult, but now, traceability along the whole mine-to-market diamond supply chain is being realized. Natural diamond retailers are launching their own traceability platforms and collaborating with technology providers to ensure their supply

chains meet the demands of global policies on social and environmental regulations as well as heightened sustainability expectations from their customers.

The diamond supply chain consists of mining and trading processes followed by certification, cutting, polishing and manufacturing before it enters the retail landscape and is sold to consumers.

## DIAMOND SUPPLY CHAIN LEVELS

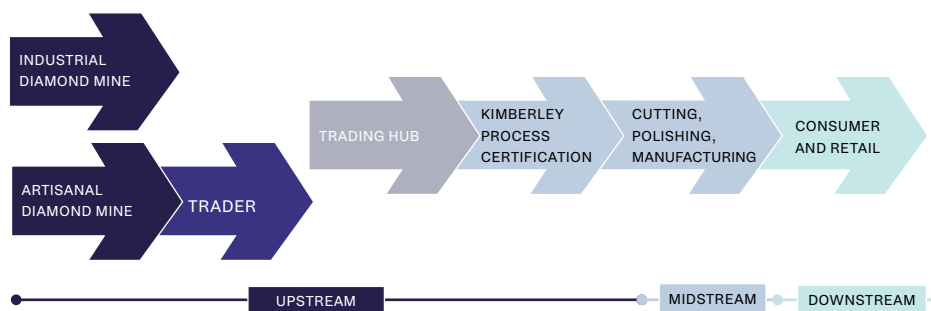


Figure 8 - Diamond supply chain levels. Source: Kroll<sup>187</sup>

Supply chain traceability involves tracking the journey of diamonds at each stage of production, from raw material mining through to the moment when it is sold in store. Provenance, refers more specifically to the details on companies and processes of how a diamond may move through the supply chain and what exactly happens at each step. Historically, tracing raw materials and minerals for diamonds across the globe has been difficult as there was no centralized digital database for natural diamond certification records.

But now, the mine-to-market diamond supply chain is being realized. The natural diamond industry is focusing on implementing a chain of custody through traceability initiatives that are enabled by technology to ensure diamonds are ethically sourced and real.

Not only can supply chain traceability enhance supply chain efficiencies for the natural diamond industry, but it is also critical to decrease the likelihood of conflict diamonds or synthetic diamonds entering the system. Multiple factors have catalyzed the need for supply chain traceability.

From investor demands for stronger ESG (Environmental, Social, Governance) performance, expectations from customers about social due diligence, as well as heightened regulation across the supply chain, the natural diamond industry is working at pace to achieve this.

<sup>187</sup>Kroll (2020) How due diligence can address risks in the diamond industry. <https://www.kroll.com/en/insights/publications/compliance-risk/supply-chain-due-diligence-diamond-industry>

At a legislative and global guidance level, there are multiple developments that underline the need for traceability including the Dodd-Frank Act, OECD Due Diligence Guidance, UK Modern Slavery Act and the California Transparency in Supply Chains Act. More recently, the EU Conflict Mineral Regulation and the London Metal Exchange Responsible Sourcing initiative require players to abide by the OECD's five-step risk-based Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas<sup>188</sup>.

It's no secret that sustainability, transparency and social issues have become a priority for consumers. In their latest Global Diamond Industry report, Bain & Company note that the growing desire for social impact, especially amongst younger consumers is prompting mining companies to address environmental and social issues, including traceability and transparency<sup>189</sup>. Members of the natural diamond industry are working proactively to mitigate these supply chain risks.

## The mine-to-market supply chain

Enabled by technology like blockchain, initiatives are being designed by producers, retailers, manufacturers and grading organizations to enhance traceability and share the story of the diamond with customers in order to increase trust.

Blockchain technology creates a peer-to-peer network of trade along value chains to provide a history of transactions for a single product, like a natural diamond. It has previously been described as a digital decentralized, distributed and public ledger of what happens across a supply chain.

For the last few decades, the industry has been reliant on the Kimberley Process Certification scheme to regulate trade in rough diamonds to prevent inflows of conflict diamonds. This paper-based process has since been digitized on blockchain which has made it more efficient<sup>190</sup>. The benefits of blockchain technology for the industry are far-reaching. It can ensure that when diamonds

are traded on blockchain, each transaction undergoes a clearance process. This helps with ensuring that traders comply with regulations related to the Kimberley Process, anti-money laundering and global banking protocols. It also helps to trace a diamond's lifespan and creates more data for managers in industry<sup>191</sup>.

<sup>188</sup>Kroll (2020) How due diligence can address risks in the diamond industry. <https://www.kroll.com/en/insights/publications/compliance-risk/supply-chain-due-diligence-diamond-industry>

<sup>189</sup>Bain & Company (2022) The global diamond industry 2021 – 2022. Available at: <https://www.bain.com/insights/a-brilliant-recovery-shapes-up-the-global-diamond-industry-2021-to-22/>

<sup>190</sup>WEF (2018) From diamonds to recycling: how blockchain can drive responsible business [rehttps://www.weforum.org/agenda/2018/06/diamonds-recycling-blockchain-technology-responsible-ethical-businesses/](https://www.weforum.org/agenda/2018/06/diamonds-recycling-blockchain-technology-responsible-ethical-businesses/)

<sup>191</sup>LCX (2022) Blockchain technology in diamond trading. Available at: <https://www.lcx.com/blockchain-technology-in-diamond-trading/#:~:text=The%20blockchain%20can%20be%20used,they%20comply%20with%20all%20regulations.>

### **SPOTLIGHT: TRACR™ BY DE BEERS GROUP**

De Beers Group pioneered digital tracking of a diamond from mine-to-store in 2018 when it followed the journey of 100 high-value diamonds using its blockchain platform, Tracr™. This has since been named one of Forbes top 50 leading blockchain solutions.

How does it work? The Tracr™ platform combines distributed ledger technology with advanced data security and privacy, ensuring that participants control the use of and access to their own data.

Each participant on Tracr™ has their own distributed version of the platform, meaning that their data can only be shared with their permission, and only they choose who can access their information.

The advanced privacy technologies used by Tracr™ reinforce data security on the platform. The alterable nature of each transaction on the platform ensures that the data cannot be tampered with when the diamond progresses through the value chain.

As of 2022, De Beers Group has registered \$2.2 billion total value of diamonds on the platform and 25% of its production by value is recorded. The platform now has the ability to register up to one million diamonds per week.

Tracr™ complements the intent of the De Beers Group Code of Origin, which is a customized unique code assigned to each diamond that provides assurance that it is natural, produced with high ethical standards and was discovered by De Beers in Botswana, Canada, Namibia or South Africa<sup>192</sup>. As the latest announcement, the GIA will also join Tracr.

Consumers purchasing a diamond traced from the source by Tracr and graded by GIA will receive a GIA grading report with enhanced information about the provenance of their diamond<sup>193</sup>.

### **SPOTLIGHT: SARINE TRACEABILITY ECOSYSTEM**

Sarine Technologies has built a high-performance tracking system for tracing rough diamonds. Their data-based platform spans the entire pipeline from the mine to the consumer. It connects miners, manufactures and retailers across the world. Retailers who use Sarine's traceability ecosystem receive a Diamond Journey digital report which provides customers with the story of the diamond<sup>194</sup>.

Natural Diamond Council member Lucara Diamond is also leveraging Sarine's technology to design a solution called Clara. Clara scans diamonds to create digital ID's tagged using blockchain and then are uploaded to the Sarine platform. Manufacturers can place orders for diamonds based on desired properties and Clara uses the analytics to match each order with diamonds to reduce the number of intermediaries handling the stones and making it easy to trace with a verifiable digital record<sup>195</sup>.

Everledger is a blockchain technology provider helping to increase traceability of the diamond supply chain for retailers. It traces a jewel's ownership from mine to ring and as of 2017, had recorded over 1.6 million diamonds on the platform<sup>196</sup>. In an interview, Everledger founder Leanne Kemp stated that "In the case of a diamond, it is unique like a snowflake, so we can identify every single stone.", and that it helps to answer important questions about who was involved in the making and extraction of minerals and gemstones<sup>197</sup>. The company works with brands like Brilliant Earth, who stated they have upward of 10% of their diamond inventory on blockchain. How does it work for a brand? Brilliant Earth would buy a blockchain enabled diamond from a mining operator where its unique properties are logged onto the blockchain. That assigned record then follows the diamond across the supply chain, from trading to cutting and polishing before being purchased<sup>198</sup>.

<sup>192</sup> De Beers Group (n.d.) Code of origin. Available at: <https://www.debeersgroup.com/code-of-origin>

<sup>193</sup> De Beers (2023) GIA Joins Tracr. Available at: <https://www.debeersgroup.com/media/company-news/2023/gia-joins-tracr>

<sup>194</sup> Sarine (2022) Enabling traceability, enhancing the supply chain. Available at: <https://blog.sarine.com/enabling-traceability-enhancing-the-supply-chain>

<sup>195</sup> Ibid.

<sup>196</sup> Wired (2017) How blockchain is stopping the spread of conflict diamonds. Available at: <https://www.wired.co.uk/article/blockchain-conflict-diamonds-everledger>

<sup>197</sup> FT (2019) Transformations in the supply chain. Available at: <https://www.ft.com/content/58642d44-d41c-11e9-8d46-8def889b4137>

<sup>198</sup> Barrons (2022) How this company is using blockchain to buff up the image of diamonds. Available at: <https://www.barrons.com/articles/brilliant-earth-blockchain-diamonds-51647294829>

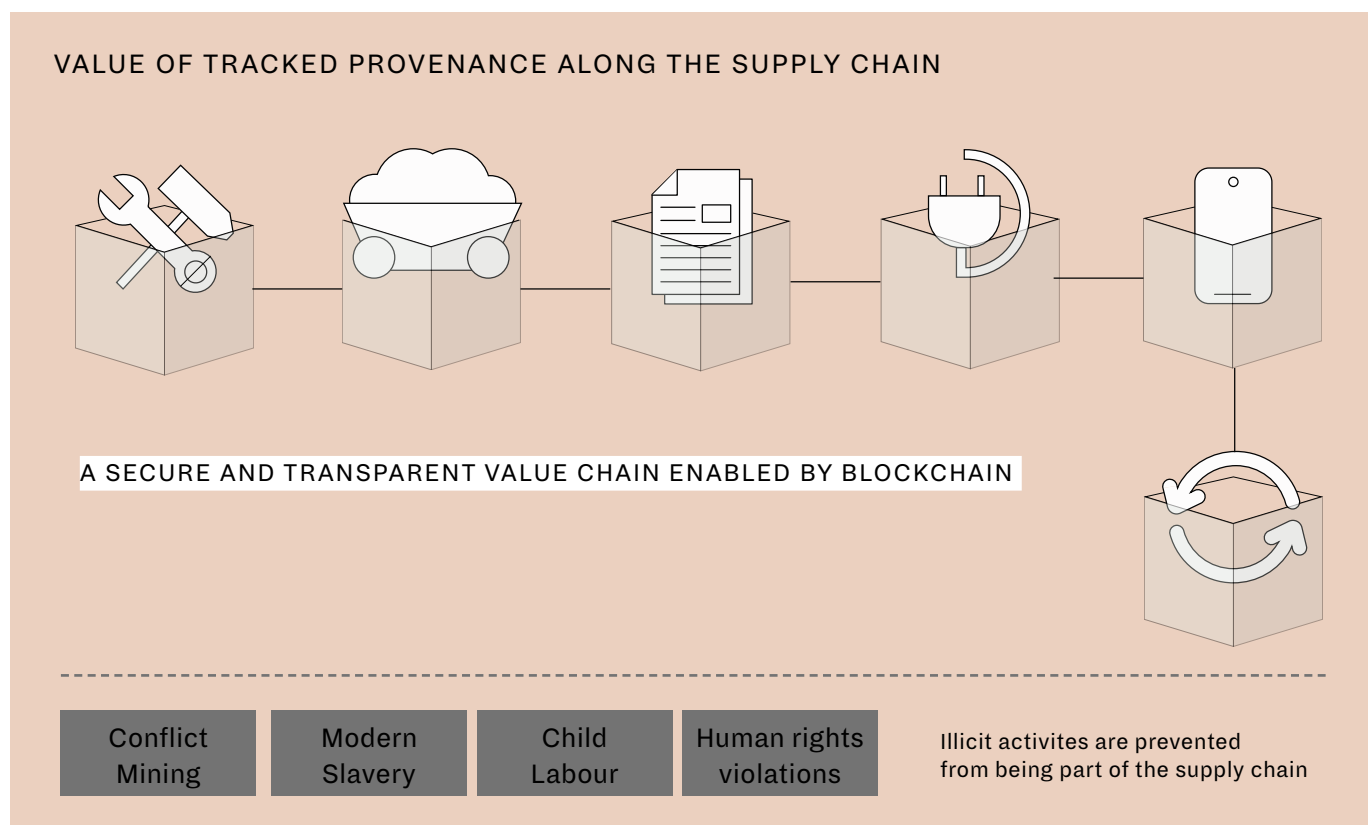


Figure 9- Source: World Economic Forum<sup>199</sup>

There are multiple other initiatives and mechanisms in place to cultivate traceability.

The Responsible Jewellery Council has specific provisions about what its members can claim about the way they source materials like diamonds. Provision 14 stipulates that any company that makes claims about the provenance of materials (Source, origin and practices) have to be audited<sup>200</sup>. The Gemological Institute of America (GIA) has a specific Diamond Origin report that helps to share the story of the mining of each stone and has a science-based methodology for determining a given diamond's country of origin<sup>201</sup>.

Luxury brands like Tiffany & Co are leading when it comes to sharing provenance about their diamonds. In 2019, they began providing geographical sourcing information for customers for diamonds of 0.18 carats or larger with a T&Co serial number. In 2020, they built on this to share details of the journey including where each stone was cut, polished, and set.

They also worked with the Initiative for Responsible Mining Assurance to develop a standard that provides the world's first shared definition of leading practices for large-scale mining operations<sup>202</sup>.

Luxury leaders like LVMH are involved in the industry's traceability push too. Alongside Prada Group, Cartier and OTB Group, they founded the Aura Blockchain Consortium which will be using Sarine's diamond traceability platform for their jewelry<sup>203</sup>.

All these efforts underscore how important reducing harmful supply chain risks and creating a positive impact across each stage of production is for the natural diamond industry. Technology is one tool to achieve traceability, and the industry will have to move beyond compliance and advocate for rigid due diligence across all countries it operates.

**This is only the beginning.**

<sup>199</sup> WEF (2018)

<sup>200</sup> Responsible Jewellery Council (2019) Provision 14. Available at: <https://www.responsiblejewellery.com/training/cop-2019-walkthrough/provision-14/>

<sup>201</sup> GIA (n.d.) Diamond origin. Available at: <https://discover.gia.edu/diamond-origin.html>

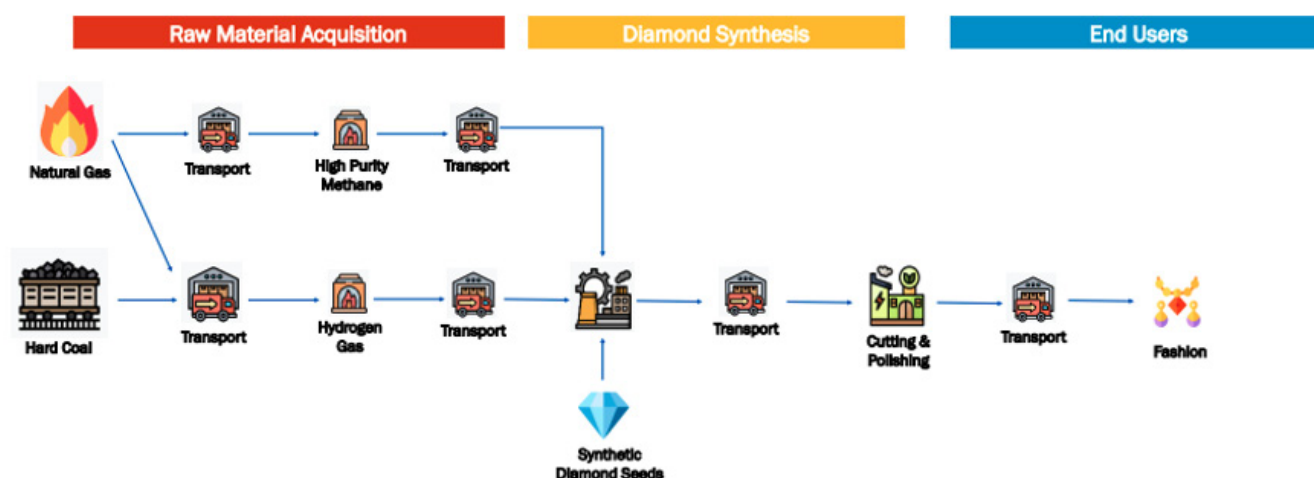
<sup>202</sup> The Week (2020) Tiffany & Co: Pioneering diamond traceability. Available at: <https://www.theweek.co.uk/951538/tiffany-co-pioneering-diamond-traceability>

<sup>203</sup> Professional Jeweller (2022) Cartier, Bulgari and more add latest development in diamond traceability. Available at: <https://www.professionaljeweller.com/cartier-bulgari-and-more-add-latest-development-in-diamond-traceability/>

# Annexes

## Annex I

### The process of raw material extraction for laboratory-grown diamonds



## Annex II

### Overview of Northwest Territories (NWT, Canada) regulatory process, by Ryan Fequet, Executive Director for the Wek' èezhìi (Mackenzie Valley) Land and Water Board.

In the Northwest Territories (NWT, Canada) the finalization of some Land Claim Agreements (or Modern Treaties) in the early 1990s resulted in a unique, progressive, and empowering piece of legislation called the Mackenzie Valley Resource Management Act (MVRMA, enacted in 1998). The MVRMA and associated Land Claims created the regional Land and Water Boards of the Mackenzie Valley (LWBs) the Mackenzie Valley Environmental Impact Review Board (MVEIRB), the Renewable Resource Boards, as well as Land Use Planning Boards; collectively referred to as the Boards. Together, these entities make up the co-management system that ensures a holistic and integrated approach to renewable and non-renewable resource management.

The LWBs, responsible for issuing authorizations required for projects, have established policies, guidelines, and standards to guide applicants and resource developers through the environmental

impact assessment (EIA), permitting, and licensing processes – and to ensure that all projects are designed for closure from the start. The process begins with the requirement for early engagement with land owners, traditional land users, and other potentially affected parties. The level of effort for this required engagement is scaled to the nature of the potential resource development project. Similarly, the information requirements related to proposed activities are also flexible to ensure the level of effort is reasonable for the size, type, and location of the activities.

All applications undergo a public review process that takes place on a real-time online platform where all recommendations and the applicant's responses are visible to the public (Online Review System). Parties and the Board itself may retain technical and traditional knowledge experts to assist with document review and with ensuring that proposed activities would be carried out in the most appropriate way by helping to assess the potential impacts and mitigations; this step is known as preliminary screening – the first of the three levels of EIA.

There are legislated timelines for the LWBs and MVEIRB to carry out their processes, that range from 52 days to three years depending on the nature of the proposed project (where the longer period would include a full Environmental Assessment prior to regulatory permitting).

Because the Boards are administrative tribunals that must ensure procedural fairness, at the end of each process the Boards produce a Reasons for Decision that explain how all of the evidence that was provided throughout the process was considered. When a Land Use Permit and, or a Water License is issued by a Land and Water Board, it contains requirements for: management plans, monitoring programs, reporting, and the posting of security – which is the amount it would cost for a third party to come in and reclaim the site to ensure there is financial incentive for the project to reclaim the project site.



A standard requirement is that all management plans must be reviewed each year, and any proposed revisions sought by the Licensee must be provided to the respective Land and Water Board for approval. An Annual Report is also a standard requirement and ongoing environmental monitoring and response plans (when pre-defined triggers are met to avoid reaching an unacceptable level of change in the environment) come in monthly or more frequently as needed.

Regular inspections take place by the federal or territorial government to ensure a project is compliant with the conditions of its permit and, or license. Inspection reports and all submissions and correspondence with the Board are made available on the public registry.

# Glossary

## ASSURE PROGRAM

The Natural Diamond Council established the ASSURE Program in 2019. It assesses the relative performance of Diamond Verification Instruments available on the market. All results can be found via the ASSURE Directory, in addition to evaluation criteria such as diamond false positive rates, diamond referral rates and diamond accuracy.

## BLOCKCHAIN

A digital shared database or ledger, that is distributed amongst nodes of a peer-to-peer network. As a database, it stores information electronically and holds a record of transactions which cannot be edited. This means that the history of transactions are permanently recorded and accessible for anyone across the supply chain network.

## CARBON FOOTPRINT

The quantity of greenhouse gas emissions expressed in terms of carbon dioxide equivalent (CO<sub>2</sub>e), emitted into the atmosphere by an individual, organization, process, product or event from within a specified boundary. The word equivalent is used in the metric as other greenhouse gases besides carbon dioxide, such as methane, are also released into the atmosphere but they are incorporated to create one standard figure for comparison and tracking over time.

## CARBON INTENSITY

A measure of the carbon footprint (in terms of carbon dioxide and other greenhouse gases emissions) per unit of activity. For diamonds, carbon intensity is typically calculated by totaling the greenhouse gas emissions over a period from a laboratory or mine and dividing this by a measure of production in that period. This is usually either rough or polished carats.

## CARBON OFFSETTING

A process that involves a reduction in, or removal of, carbon dioxide or other greenhouse gas emissions from the atmosphere in order to compensate for emissions made elsewhere.

## CARBON SEQUESTRATION

Entails the capturing, removal and storage of carbon dioxide (CO<sub>2</sub>) from the earth's atmosphere. It's recognized as a key method for removing carbon from the earth's atmosphere.

## CHEMICAL VAPOR DEPOSITION (CVD)

A process to make laboratory-grown diamonds. CVD uses a small diamond seed crystal and places it into a chamber, which is then filled with gases heated at extreme temperatures of around 900-1200°C. As the chamber reaches the right temperature, layers of carbon begin to form on the seed crystal, which then grows into a diamond crystal. CVD involves breaking down the molecules of a carbon-rich gas, such as methane, into carbon and hydrogen atoms, which then are deposited on diamond seeds to produce a square-shaped, tabular diamond crystal.

## DIAMOND DEVELOPMENT INITIATIVE (DDI)

A non-profit organisation that works with an ecosystem of businesses, government and social services to encourage development and growth in businesses involved in diamond mining and promote sustainable and social impact. In 2020, it joined forces with RESOLVE in a program merger to strengthen the capacity of the responsible sourcing of diamonds and minerals for communities, companies and consumers. RESOLVE works across various sectors to design sustainable solutions to critical social, health, and environmental challenges by creating innovative partnerships where they are least likely and most needed.

**ENERGY EFFICIENCY**

Refers to the use of less energy to perform the same task or produce the same result.

**ESG (ENVIRONMENTAL, SOCIAL, GOVERNANCE)**

ESG is a framework that helps stakeholders understand how an organization is managing risks and opportunities related to environmental, social, and governance criteria.

**FEDERAL TRADE COMMISSION (FTC)**

An independent agency of the United States government whose principal mission is the enforcement of civil anti-trust law and the promotion of consumer protection.

**GEMOLOGICAL INSTITUTE OF AMERICA (GIA)**

GIA is an authority on diamonds, colored stones, and pearls. A public benefit, non-profit institute, GIA is the leading source of knowledge, standards, and education in gems and jewelry.

**GREENHOUSE GAS EMISSIONS (GHG)**

Greenhouse gases are gases in the earth's atmosphere that trap heat causing the greenhouse effect. They include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>). These emissions are converted into CO<sub>2</sub>e using global warming potentials (GWPs) provided in assessments of the Intergovernmental Panel on Climate Change.

**HIGH PRESSURE, HIGH TEMPERATURE (HPHT)**

A process to create laboratory-grown diamonds. HPHT involves placing a diamond seed into a press inside a chamber which is heated to temperatures of 1300-1600 °C with pressures above 870,000 pounds per square inch. The hot metal plates dissolve the high-purity carbon source and as a result, carbon atoms form on the seed crystal, before the diamond continues to grow.

**ISO14001**

Sets out the criteria for an environmental management system. It maps out a framework that

a company or organization can follow to set up an effective environmental management system.

**INTERNATIONAL LABOR ORGANIZATION**

A United Nations agency whose mandate is to advance social and economic justice by setting international labor standards.

**KIMBERLEY PROCESS CERTIFICATION SCHEME (KPCS)**

The Kimberley Process Certification Scheme is the process established in 2003 to prevent "conflict diamonds" from entering the mainstream rough diamond market by United Nations General Assembly Resolution 55/56 following recommendations in the Fowler Report.

**LABORATORY-GROWN DIAMOND**

A synthetic, man-made diamond created in a laboratory through Carbon Vapor Deposition (CVD) or High Pressure High Temperature (HPHT) processes.

It is an artificial product which has essentially the same chemical composition, physical properties and structure as that of a diamond. The terms "synthetic", "laboratory-created" and "laboratory-grown" are synonymous with one another. In USA, the Federal Trade Commission also accepts "[manufacturer's name] created diamond". Where there is no acceptable local direct translation of the English terms laboratory grown diamond or laboratory created diamond then only the translation of the term synthetic diamond should be used.

**DIAMOND MINING**

*Alluvial mining* - An above-ground form of mining that concentrates on gathering diamonds on the surface from deposits of sand, gravel and clay. *Beach mining* - Involves combing beaches and excavating deposits using machines to move the sand.

*Marine mining* - A method used for drawing diamonds from the sea with the help of mining vessels. *Pipe mining* - There are two types of pipe mining. Open-pit mining involves removing

the layers of sand and rock found just above the kimberlite. In underground mining, miners tunnel through Earth's crust to the kimberlite pipe. Tunnels are constructed on two levels, one above the other with funnels built to connect the two.

#### MAENDELEO DIAMOND STANDARDS

The Maendeleo Diamond Standards (MDS) establish requirements adapted to the specific conditions of artisanal and small-scale diamond mining communities. Maendeleo is a Swahili word meaning development and progress. The standards apply to diamonds mined in conflict-free zones and produced safely with consenting and engaged communities. MDS operations are violence-free, respect human and worker rights, and follow practices that promote environmental responsibility.

#### NATURAL DIAMOND

A diamond is a mineral created by nature; a "diamond" used on its own always means a natural diamond.

#### OECD DUE DILIGENCE GUIDANCE FOR RESPONSIBLE SUPPLY CHAINS OF MINERALS

Provides detailed recommendations to help companies respect human rights and avoid contributing to conflict through their mineral purchasing decisions and practices.

#### RESPONSIBLE JEWELLERY COUNCIL (RJC) CODE OF PRACTICES (COP)

Defines the requirements for establishing responsible business practices throughout the jewelry supply chain, from mine to retail. The COP provides a common standard for ethical, social, human rights and environmental practices, and certification against it is mandatory for all RJC commercial members.

#### SCOPE 1 EMISSIONS

Covers emissions from sources that an organization owns or controls directly. For the diamond industry, this could include emissions from hydrocarbons, diesel, marine gas, oil or petrol used to power machinery used to mine for diamonds or transport like trucks and ships.

#### SCOPE 2 EMISSIONS

Scope 2 encompasses emissions that are caused indirectly when energy is purchased and used in production. This could include emissions from electricity generation through to power generators used for buildings and the infrastructure surrounding a given mine.

#### SCOPE 3 EMISSIONS

Includes emissions that are not produced by the company itself but are a result of indirect activities owned by different stakeholders in the supply chain, like suppliers and transport facilitators.

#### SOCIO-ECONOMIC AGREEMENTS (SEAS)

A socio-economic agreement is usually agreed between a private organization and a public body. It outlines the commitments and predictions made by a company during its environmental and social environmental assessment including:

- Employment and business opportunities
- Cultural well-being and traditional economy
- Community, family, and individual well-being
- Net effects on government
- Sustainable development

#### UNITED NATIONS GUIDING PRINCIPLES ON HUMAN RIGHTS

The UN Guiding Principles on Business and Human Rights is a set of guidelines for States and companies to prevent, address and remedy human rights abuses committed in business operations.

#### WORLD DIAMOND COUNCIL SYSTEM OF WARRANTIES (SOW)

The System of Warranties (SoW) was developed in 2002, by the World Diamond Council. It requires professional buyers and sellers of rough diamonds, polished diamonds and jewelry setters with diamonds to include a warranty statement on invoices and memos each time a diamond changes hand.

# Natural Diamond Council Members Sustainability Reports

READ MORE ABOUT THE ENVIRONMENTAL AND SOCIAL PERFORMANCE  
OF OUR MEMBERS HERE:

DE BEERS GROUP	<a href="#">Building Forever: Our 2021 Sustainability Report</a> <a href="#">Building Forever: 2030 Goals – Progress Update 2021</a>
PETRA DIAMONDS	<a href="#">Sustainability Report 2022</a>
LUCARA DIAMOND	<a href="#">Sustainability Report 2021</a>
RIO TINTO	<a href="#">Socio-Economic Monitoring Report 2021</a>
MUROWA DIAMONDS	<a href="#">Sustainability Report 2020</a>
ARCTIC CANADIAN DIAMOND COMPANY	<a href="#">Ekati Socio-Economic Monitoring Report 2021</a>

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