Lab-Grown Diamonds

Prelims: Lab-Grown Diamonds, Naturally Occurring Diamonds, Allotrope of Carbon, HPHT Method, CVD Method.

Mains: Lab-Grown Diamonds and its Significance

Why in News?

The Ministry of Finance (MoF) in its 2023-24 Union Budget has put special emphasis on **Laboratory-Grown Diamonds (LGD).**

- Scientists working at a General Electric research laboratory in New York are credited with the creation of the **world's first-ever LGD in 1954.**

What are Laboratory-Grown Diamonds?

- **About:**
  - LGD are manufactured in laboratories, as opposed to naturally occurring diamonds. However, the **chemical composition and other physical and optical properties** of the two **are the same.**
  - Naturally occurring diamonds take millions of years to form; they are created when carbon deposits buried **within the earth are exposed to extreme heat and pressure.**
- **Manufacturing:**
  - They are mostly manufactured through two processes, **High Pressure,High Temperature (HPHT)** method or **Chemical Vapour Deposition (CVD)** method.
  - Both HPHT and CVD methods of growing diamonds artificially begin with a seed, **a slice of another diamond.**
    - **In the HPHT method,** the seed, along with pure graphite carbon, is exposed to temperatures around 1,500 degrees Celsius and extremely high pressure.
    - **In the CVD method,** the seed is heated to around 800 degrees Celsius inside a sealed chamber filled with a carbon-rich gas. The gas sticks to the seed, gradually building the diamond.
- **Applications:**
  - They are used for industrial purposes in **machines and tools and their hardness and extra strength** make them ideal for use as cutters.
  - Pure synthetic diamonds are used in electronics as a heat spreader for high-power laser diodes, **laser arrays and high-power transistors.**
- **Significance:**
  - The **environmental footprint** of a diamond grown in a laboratory is **much lesser than** that of a naturally occurring diamond.
  - According to a report by Diamond Foundry, an environmentally conscious LGD manufacturer, it takes **ten times more energy to extract a natural diamond** from the earth than it takes in creating one above the ground.
  - Open-pit mining, one of the most common methods of mining naturally occurring

diamonds, involves **moving tonnes of earth and rock to extract these precious stones.**

What is the Scenario of India's Diamond Industry?

- India is the **world's largest cutting and polishing center for diamonds,** accounting for over 90% of polished diamond manufacturing globally. This is attributed to factors such as the **easy availability of high skilled labour, cutting-edge technology,** and lower costs involved.
    - **Surat** in Gujarat is a **global hub for diamond manufacturing.**
    - The US is the biggest market for cut and polished diamonds, with China a close second.
- India contributes **19% of the total diamond exports in the world.**
- The UAE is also the largest export destination for Indian gold jewellery, accounting for over 75% of the South Asian country's jewellery exports.
- India's overall exports of gems and jewellery in November 2022 were USD 2.43 billion, up 2.05 % from the same year-ago period.

What are the Government Initiatives to Promote Lab-Grown Diamond?

- The 2023 Union Budget promises to reduce **the basic customs duty on seeds used in the manufacture of lab-grown diamonds** in a bid to popularise their production in India— the duty on seeds for rough LGDs will be reduced from 5% to nil.
- A **five-year research grant will also be provided** to one of the Indian Institute of Technologies (IITs) for research and development in the field of LGDs.
- MoF has also proposed the **creation of new tariff lines to help in better identification of a number of products,** including synthetic diamonds. The aim of the move is to help facilitate trade as well as to have clarity on availing concessional import duty.

Source: TH