Global Innovation Index 2025

For Prelims: World Intellectual Property Organization, Global Innovation Index, Intellectual Property, Fund of Funds for Startups, National Semiconductor Mission, IndiaAI Mission, Atal Tinkering Labs.

For Mains: Performance of India in Global Innovation Index 2025, challenges associated with India's innovation ecosystem and ways to address them.

Source: ET

Why in News?

India has climbed to the **38th position** among **139 economies** in the **World Intellectual Property Organization's (WIPO) Global Innovation Index (GII) 2025**, improving from **48th place** in **2020**.

Global Innovation Index

- The **Global Innovation Index (GII)**, introduced in **2007**, was developed to provide **comprehensive metrics and methodologies** for assessing the wide spectrum of **innovations across economies**.
- Published annually by the **World Intellectual Property Organization (WIPO)**, the GII has become a **key benchmark** for evaluating an economy's **innovation ecosystem**.
- Recognized by the **UN General Assembly** as an **authoritative reference** for shaping **Science, Technology, and Innovation (STI) policies**.

What are the Key Highlights of the GII 2025?

- **India Related Findings:** India rose from **81st (2015) to 38th (2025)**, ranking **1st** among lower-middle-income economies and in **Central & Southern Asia**.
    - Its strengths are **Knowledge & Technology Outputs (22)** and **Market Sophistication (38)**; weaknesses lie in **Business Sophistication (64)**, **Infrastructure (61)**, and **Institutions (58)**.
- **Top-Ranked Economies:** The **top five** most innovative economies are **Switzerland (1st), Sweden (2nd), USA (3rd), South Korea (4th), and Singapore (5th)**. **China** ranked in the **top 10** for the first time, securing the **10th position**.
- **Top Innovation Clusters:** The world's top **innovation clusters** are **Shenzhen–Hong Kong–Guangzhou (1st)** in China and Hong Kong, and **Tokyo–Yokohama (2nd)** in Japan.
- **Positive Socioeconomic Impact: Labor productivity** rose **2.5%** in 2024, **global life expectancy** reached **73 years**, and **extreme poverty** fell to **817 million**, under half of 2004 levels.
- **Rapid Technological Advancement:** In 2024, **technology advanced** with notable gains in **supercomputing efficiency** and **battery prices**. However, **adoption slowed**, progress

in **wind power** and **genome sequencing** lagged, and **novel drug development** regressed.

What is the Current Status of India's Innovation Landscape?

- **Funding Mechanism:** As per the latest available R&D statistics, India invested **0.65% of GDP** in R&D, compared to **China (2.43%)**, **Brazil (1.15%)**, and **South Korea (2.5%)**.
- **Patent Filings:** India now ranks **6th globally** in terms of **patent applications**. Meanwhile, India's **patent-to-GDP ratio**—a measure of the economic impact of patent activity—grew significantly, from **144 in 2013 to 381 in 2023**.
- **Strategic Policy Support:** Programs like **Startup India**, **Make in India**, and **Production Linked Initiative (PLI) scheme** offer foundational support.
    - The **Fund of Funds for Startups (FFS)** has a **Rs 10,000 crore corpus**, and the new **one lakh crore Research, Development, and Innovation (RDI) scheme** seeks to boost **private sector R&D**.
    - The **Startup India Hub** links more than **1,140 incubators and accelerators**. In **2023**, the **Startup India Seed Fund Scheme** provided **Rs 945 crore** for **seed funding**.
- **DeepTech Push:** Significant investments focus on strategic sectors, with the **National Semiconductor Mission** backed by **Rs 76,000 crore**, alongside the **IndiaAI Mission** and **PLI for quantum technologies** to enhance **self-reliance.**
- **Rise of Unicorns & Cleantech:** India has over **100 unicorns**, the **3rd-largest ecosystem globally**. The **private sector** leads in **Cleantech**, with startups like **Ather Energy** and **Ola Electric**.
- **Geographical Diversification:** Initiatives like **Atal Tinkering Labs (ATLs)** are decentralizing innovation, with over **45% of DPIIT-recognized startups** emerging from **tier-2 and tier-3 cities**.

What are the Barriers to India's Innovation Ecosystem?

- **Inadequate Financial Investment:** India's **gross expenditure on R&D (GERD)** remains **~0.7% of GDP**, far below leading innovative nations like the United **States (3.5%)**, **South Korea (4.9%)**, and **Israel (5.6%)**, highlighting a critical **funding gap**.
- **Dominance of Public Sector in R&D Funding:** India's **innovation ecosystem** is largely **publicly funded**, with the **private sector contributing only 36.4%** (2020–21), unlike advanced economies where **industry leads R&D investment**.
    - Additionally, a **disconnect between academic research and industry needs** limits **interdisciplinary collaboration** and **commercialization of research**.
- **Skewed Focus Towards Strategic Sectors:** Historical R&D focus on **defense** and **space technology** (e.g., **Agni missile systems, space missions**) has led to under-investment in **industrial R&D** for **emerging areas** like **semiconductors**, **advanced materials, pharmaceuticals**.
- **Risk-Averse Industrial Culture:** Industries prefer **importing proven technologies** over **high-risk, long-gestation indigenous R&D**; startups focus on **business model innovations** in **IT services and e-commerce** rather than **foundational deep-tech research**.
- **Bureaucratic Hurdles:** Despite achievements by **DRDO**, **ISRO**, **BARC laboratories**, **technology transfer** to the market is impeded by **procedural delays, intellectual property challenges**, and lack of **streamlined processes.**

What Reforms are Needed to Strengthen India's Innovation Ecosystem?

- **Boost R&D Investment:** India should **boost R&D spending** over the next decade, increase **private and philanthropic contributions**, and fully deploy the **Rs 1 lakh crore innovation fund (Union Budget 2025–26)** within 3–5 years to accelerate **deep-tech research**.
- **Promote University-Led Research: Higher Education Institutions (HEIs)** can drive **upstream research** to expand knowledge frontiers and **help industry commercialize mature technologies**.

- **Establish Public-Private Innovation Hubs:** India should establish **sector-specific innovation hubs** in **AI, semiconductors, and clean energy**, linking **government, academia, and industry**, and providing **shared resources** like **testing facilities, prototype labs, and venture funds.**
- **Facilitate Cross-Sector Collaboration: Sector-specific industry councils can guide policy, pinpoint funding gaps, and channel resources to critical innovation sectors. For instance, a CleanTech Council could prioritize solar, EVs, and energy efficiency.**
- Regional Innovation Clusters: Regional innovation clusters in non-metro areas can leverage local government and private resources to foster entrepreneurship and innovation, supporting rural agri-tech and social enterprises with funding, mentorship, and infrastructure.

Conclusion

India's **innovation ecosystem** has advanced significantly, reaching **38th in GII 2025** and topping **lower-middle-income economies**. While strategic policies have driven this rise, challenges remain in **R&D funding, industry-academia collaboration**, and **private sector investment**. Sustaining growth will require increasing **GERD**, promoting **deep-tech**, and building **synergistic ecosystems** to evolve from a **startup hub** into a **global innovation leader**.

Drishti Mains Question:

Q. Critically evaluate the barriers in India's innovation ecosystem and suggest reforms to enhance deep-tech research and commercialization.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. Which of the following statements is/are correct regarding National Innovation Foundation-India (NIF)? (2015)

1. NIF is an autonomous body of the Department of Science and Technology under the Central Government.
2. NIF is an initiative to strengthen the highly advanced scientific research in India's premier scientific institutions in collaboration with highly advanced foreign scientific institutions.Select the correct answer using the code given below:

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

Ans: (a)

Mains

Q. Scientific research in Indian universities is declining, because a career in science is not as attractive as are business professions, engineering or administration, and the universities are becoming consumer-oriented. Critically comment. (2014)

India-US Corn Conundrum

Source: TH

Why in News?

The **US** has expressed interest in **exporting corn** to **India**, but **India** remains **cautious** due to **GM crop concerns**, **strong domestic production**, and **political considerations**.

What Prevents India from Importing Corn from the United States?

- **Regulatory Ban on GM Imports:** India prohibits the import of **genetically modified (GM) corn**. With **94% of US corn in 2024 being GM** and India allowing GM cultivation only for **cotton**, importing US GM corn is **legally barred**.
- **High Tariff Barriers:** India's **tariff structure** discourages corn imports: a **0.5 million tonne quota** faces **15% duty**, while excess imports incur **50% duty**, making **US corn commercially unviable**.
- **Protection of Domestic Farmers:** Indian officials warn that cheap imports could threaten the **maize-for-ethanol ecosystem** and **new farmers**, prompting the government to **safeguard farmer incomes** amid rising domestic production and acreage.
- **Risk of Dumping:** The **US corn price** is just about **70%** of **Indian maize** without taking into account **shipping**, **marketing costs** and **business margins**. This would be equivalent to **dumping**, harming Indian maize farmers.
- **Sovereign Policy on Ethanol Blending:** Importing corn for **ethanol production** undermines India's goal of **import substitution**, which aims to use **domestic produce** and save **foreign exchange** rather than create dependency on imports.
    - **20% ethanol blending** in petrol could save up to **USD 10 billion in annual forex outgo** through **import substitution.**

What are Key Facts Regarding Corn(Maize)?

- **About: Corn (maize)** is a highly versatile crop, known as the **queen of cereals** for its high **genetic yield potential**.
    - Originating in **Central America**, it is a globally vital cereal for **human consumption**, **animal feed**, and **forage**.
- **Climate & Temperature:** Sensitive to frost (especially seedlings) requires a **frost-free period** with mean daily temperatures above **15°C** but tolerates **heat up to 45°C** with sufficient water.
    - It is highly responsive to **solar radiation**. Adequate **light penetration** to upper leaves is essential for **grain filling.**
- **Soil Requirements:** Prefers **well-aerated, well-drained soils**. Performs poorly on **heavy clay** or **sandy soils**, and is vulnerable to **waterlogging**.
- **Water Requirements:** It is a **water efficient crop**, needing **500–800 mm** of water to achieve **maximum grain yield**.
- **India's Global Standing:** India is the **5th largest maize producer (FAO, 2023)** but only the **14th largest exporter (UN-COMTRADE 2022)**. With yields under **4 four tonnes per hectare** (vs. global **6 t/ha**), it remains largely **self-sufficient**.
    - India has recently started **importing maize** mainly from **Myanmar** and **Ukraine.**
- **Major Producers: The top producing countries are the United States, China, and Brazil.**
    - The major maize-growing states in India are Karnataka, Madhya Pradesh, and Bihar.
- **Uses:** Maize is highly valued globally for its multifarious uses as food, feed, fodder, and raw material for industries.

- Apart from food and feed, 14–15% of India's maize is used for industrial purposes.
- It is a critical ingredient in starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceuticals, cosmetics, textiles, films, gum, packaging, and paper industries.
- **Indian Agricultural Research Institute (IARI)** has developed India's first **"waxy" maize hybrid**, high in **amylopectin starch**, making it ideal for **ethanol production.**

What are the Key WTO Provisions Enabling Import Restrictions by Countries?

Measure	Description	Key Condition
Sanitary and Phytosanitary (SPS) Measures	Countries can **set their own health and safety standards** for food, animals, and plants.	Must be **science-based, not arbitrarily discriminatory**, or a disguised trade restriction.
Agreement on Technical Barriers to Trade (TBT)	Covers technical regulations, standards, and conformity assessments (e.g., quality standards, labeling, product specifications).	Must not be **more trade-restrictive than necessary** to meet objectives like **national security, consumer protection, or environmental safety.**
Safeguard Measures	Allow temporary import restrictions **if domestic industry is threatened by a surge in imports** (unforeseen development).	Restrictions are temporary, usually require compensation, and do not require unfair trade.
Anti-Dumping	Extra duties on imports sold below normal value, causing domestic industry injury.	Dumping is proven through **pricing analysis.** A direct causal link exists between dumped imports and economic harm.
Countervailing Duties	Duties on subsidized imports causing domestic industry injury.	These duties are applied only after a thorough investigation confirms that a foreign export subsidy is causing **"material injury" to the domestic industry** of the importing country

Related Keywords for Mains

- **Atmanirbhar Agriculture**
  - **"Technology as a Plough":** AI, drones, and precision farming powering harvests.
  - "**From Lab to Land, Innovation Grows":** Translating R&D into farmer-friendly solutions.
  - **"Biotech Bharat, Bio-Secure Bharat":** Genetic advances balancing productivity and safety.
- **Crop Resilience & Diversification**
  - **"Climate-Smart Crops, Climate-Secure Nation":** Adaptation through drought- and flood-tolerant varieties.
  - **"Credit as Cultivation Catalyst":** Timely finance enabling small farmers to thrive
- **Sustainability & Resource Efficiency**
  - **"Water Saved is Wealth Gained":** Efficient irrigation and conservation practices.
  - **"Energy in Every Acre":** Solar pumps, renewable inputs, and precision energy management.
  - **"Fertilizers from the Farm, Not the Factory":** Promoting bio-inputs and organic solutions.

Conclusion

India's restrictions on U.S. corn imports stem from **GM crop bans, tariff barriers, protection of farmers, and ethanol self-reliance goals**. While India is the world's **5th largest maize producer**, low yields and rising demand drive occasional imports. Balancing **domestic protection and global trade pressures** remains a key policy challenge.

Drishti Mains Question:

Q. Discuss the factors restricting corn imports from the United States despite India's growing maize demand.

UPSC Civil Services Examination, Previous Year Questions (PYQ)

Prelims

Q. Given below are the names of four energy crops. Which one of them can be cultivated for ethanol? (2010)

(a) Jatropha

(b) Maize

(c) Pongamia

(d) Sunflower

Ans: (b)

Q. According to India's National Policy on Biofuels, which of the following can be used as raw materials for the production of biofuels? (2020)

1. Cassava
2. Damaged wheat grains
3. Groundnut seeds
4. Horse gram
5. Rotten potatoes
6. Sugar beet

Select the correct answer using the code given below:

(a) 1, 2, 5 and 6 only

(b) 1, 3, 4 and 6 only

(c) 2, 3, 4 and 5 only

(d) 1, 2, 3, 4, 5 and 6

Ans: (a)

Mains

Q.How far is Integrated Farming System (IFS) helpful in sustaining agricultural production? (2019)