



CURRENT AFFAIRS



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GLOBAL INNOVATION INDEX (GII)

This article covers "Daily Current Affairs" and the topic details "Global Innovation Index (GII)". This topic has relevance in the Economy section of the UPSC CSE exam.

For Prelims:

About the Global Innovation Index (GII)?
What is WIPO?

For Mains:

GS 2: Economy
Key Highlights of the Index?
Key Highlights Related to India?

Why in the news?

India's rank in the Global Innovation Index has risen from 81st to 40th.

THE GLOBAL INNOVATION INDEX (GII):

- The Global Innovation Index (GII) is a highly influential annual publication that evaluates and quantifies the innovation performance of economies worldwide. It stands as a crucial benchmarking tool utilized by policymakers, business leaders, and diverse stakeholders to assess and monitor a country's advancements in the realm of innovation.
- The GII is published by the World Intellectual Property Organization (WIPO) in collaboration with esteemed partners like Cornell University, INSEAD, and various other organizations and institutions.
- **Methodology of the GII:** The GII computation hinges on the amalgamation of scores derived from two distinct sub-indices: the Innovation Input Index and the Innovation Output Index.
 - **Innovation Input Index:** Comprising five pillars, the Innovation Input Index delves into various facets of innovation attributes. Each pillar encompasses a range of up to five indicators, providing a comprehensive perspective on the factors contributing to innovation.
 - **Innovation Output Index:** This index is structured around two key pillars, evaluating the tangible outcomes and results of innovation efforts in a given country.
- **Weighted Average Scoring:** The GII calculates scores for each indicator through a weighted average methodology, ensuring a nuanced and balanced assessment of innovation performance across different dimensions.

Global Innovation Index



Innovation Input Sub-index

Institutions

Political environment
Regulatory environment
Business environment

Human capital and research

Education
Tertiary education
Research and development (R&D)

Infrastructure

Information and communication technologies (ICTs)
General infrastructure
Ecological sustainability

Market sophistication

Credit
Investment
Trade, diversification, and market scale

Business sophistication

Knowledge workers
Innovation linkages
Knowledge absorption

Innovation Output Sub-index

Knowledge and technology outputs

Knowledge creation
Knowledge impact
Knowledge diffusion

Creative outputs

Intangible assets
Creative goods and services
Online creativity

KEY HIGHLIGHTS OF THE INDEX:

- **Top Innovative Economies:** Switzerland tops the list as the most innovative economy in 2023, followed by Sweden, the United States, the United Kingdom, and Singapore. Singapore has notably entered the top five and leads the South East Asia, East Asia, and Oceania (SEAO) region.
- **Top Science and Technology Clusters:** The top Science and Technology innovation clusters in 2023 include Tokyo–Yokohama, Shenzhen–Hong Kong–Guangzhou, Seoul, Beijing, and Shanghai–Suzhou. China now boasts the largest number of clusters globally, surpassing the United States.

KEY HIGHLIGHTS RELATED TO INDIA:

- **Overall Ranking and Growth:** India has achieved the 40th position in the GII 2023, significantly climbing from its 81st spot in 2015. This underscores India's consistent and substantial growth in innovation over the past eight years.
- **Leading in Lower-Middle-Income Countries:** India secures the top position among 37 lower-middle-income countries and leads among the 10 economies in Central and South America in terms of innovation.

- **Strong Innovation Landscape:** India's innovation landscape is bolstered by notable achievements in various key indicators, including ICT services exports, venture capital investments, the number of graduates in science and engineering, and global corporate R&D investors.
- **Science and Technology Clusters:** India has four S&T clusters among the world's top 100, which include Chennai, Bengaluru, Mumbai, and Delhi. This number is comparatively lower than China's 24 and the US's 21 clusters.
- **Progress and Contributors:** India's progress in innovation is attributed to its abundant knowledge capital and a thriving startup ecosystem, supported by both public and private research organizations. The COVID-19 pandemic underscored the importance of innovation in addressing challenges, aligning with India's vision of Atma Nirbhar Bharat (Self-reliant India).
- **Areas for Improvement:** India recognizes the need for improvement in several areas, particularly infrastructure, business sophistication, and institutions. NITI Aayog is actively working to promote policy-led innovation in crucial sectors such as electric vehicles, biotechnology, nanotechnology, space, and alternative energy sources to bridge these gaps.

What is WIPO?

- WIPO (World Intellectual Property Organization) serves as the worldwide platform for Intellectual Property (IP) services, policy development, information dissemination, and international cooperation.
- **Self-Funding UN Agency:** WIPO operates as a self-funding agency within the United Nations system and counts 193 member states among its constituents.
- **Objective:** The primary objective of WIPO is to lead and facilitate the development of an equitable and effective international IP system that fosters innovation and encourages creativity, ultimately benefiting all stakeholders.
- **Mandate and Governance:** WIPO's mandate, as well as its governing bodies and procedures, are outlined in the WIPO Convention, which officially established WIPO in 1967.
- **Headquarter:** Geneva

SOURCE:

<https://www.thehindu.com/news/national/other-states/indias-rank-in-global-innovation-index-has-improved-president-murmu/article65969745.ece>

Q.1 Which organization publishes the Global Innovation Index (GII)?

- United Nations Development Programme (UNDP)
- World Intellectual Property Organization (WIPO)
- World Economic Forum (WEF)
- International Monetary Fund (IMF)

ANSWER: B

Q.2 Regarding the Global Innovation Index (GII) recently seen in the news, consider the following statements:

India has improved its ranking consistently over the past decade.
India secured the top position among 37 middle-income countries.

How many of the above statements are correct?

- 1 only
- 2 only
- Both 1 and 2

(d) Neither 1 nor 2

ANSWER: A

Q.3 Discuss the role of innovation in shaping the modern economy. How does innovation impact economic growth, competitiveness, and sustainability? Provide relevant examples

Rishabh

MRNA VACCINES

This article covers "Daily Current Affairs" and the topic details "mRNA Vaccines". This topic has relevance in the "Science and Technology" section of the UPSC CSE exam.

For Prelims:

What are mRNA Vaccines?

For Mains:

GS3: Science and Technology

Why in the news?

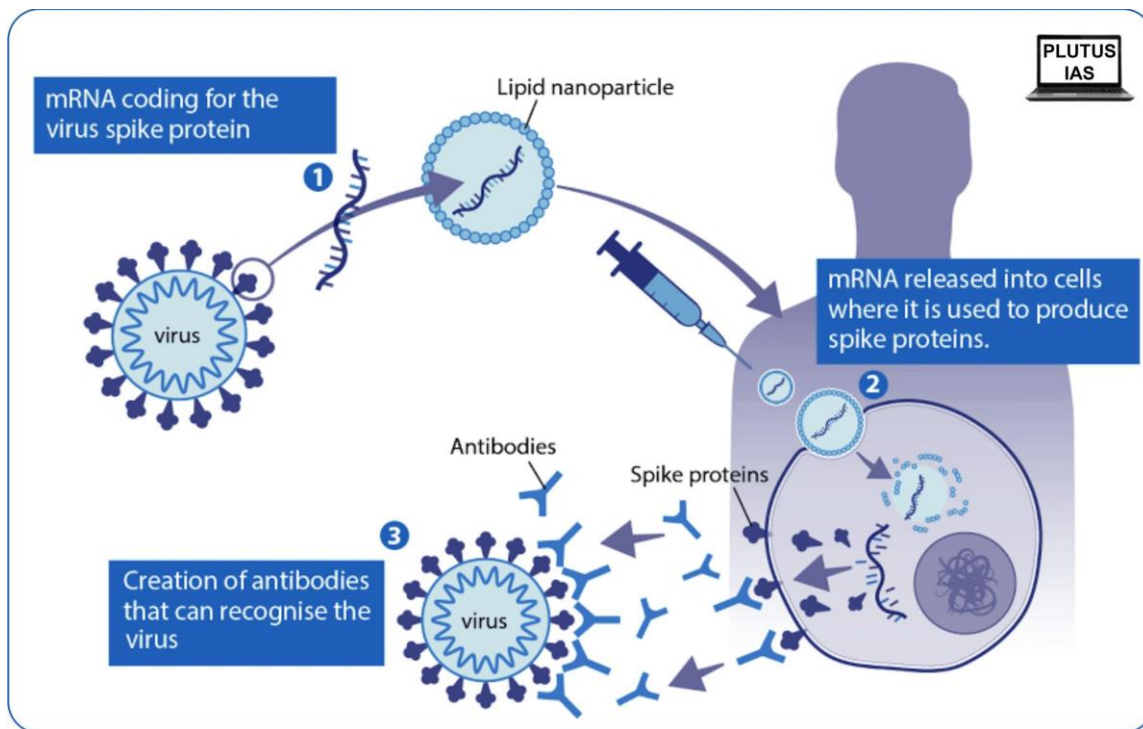
Katalin Karikó and Drew Weissman have won the 2023 Nobel Prize in Medicine for their vital contributions to mRNA vaccine development, especially for COVID-19 during the 2020 pandemic.

MRNA VACCINES

- mRNA vaccines, short for messenger RNA vaccines, refer to vaccines that use genetic material called messenger RNA to activate the immune system and produce antibodies against specific infections.

WORKING OF MRNA

- **Making of mRNA Vaccine:**
 - mRNA vaccines work by introducing a small piece of mRNA that carries the genetic instructions to produce a viral protein, usually the spike protein found on the virus's surface.
 - The mRNA is encapsulated in lipid nanoparticles to protect it and help deliver it into cells.
- **Protein Production:**
 - Once inside the body's cells, the mRNA serves as a template for protein synthesis. This mechanism is known as the Translation of genetic code.
 - The cells use this genetic information to produce the viral protein, in this case, the spike protein of the virus. This protein is then displayed on the surface of the cells, triggering an immune response.
- **Immune Response:**
 - The presence of the viral protein alerts the immune system, which recognises it as foreign and mounts an immune response.
 - This response includes the production of antibodies that can recognise and neutralise the virus if the person is later exposed to it.



ADVANTAGES:

- **Rapid Development:** mRNA vaccines can be developed quickly, making them ideal for responding to outbreaks or pandemics.
- **Flexibility and Adaptability:** The mRNA sequence in these vaccines can be easily modified to address new variants or strains of a virus.
- **Safety:** mRNA vaccines are safe as they do not use live viruses or integrate into the recipient's DNA.
- **No Risk of Integration into DNA:** These vaccines are transient and do not alter an individual's genetic material.
- **Strong Immune Response:** these vaccines stimulate a robust immune response, generating specific antibodies and activating T cells.
- **Scalability and Production:** Large quantities of these vaccines can be manufactured efficiently, allowing mass production and distribution.
- **Potential for Wide Application:** mRNA technology can be used in areas beyond infectious diseases, such as cancer immunotherapy.

CHALLENGES ASSOCIATED:

- The **manufacturing process for mRNA vaccines can be complex** and time-consuming, requiring advanced techniques to improve efficiency.
- These vaccines **require strict cold storage conditions**, posing distribution and storage logistics challenges.
- **Vaccine hesitancy and public perception** can be challenging with mRNA vaccines, requiring effective communication and education.
- The **cost** of mRNA vaccine development, production, and distribution can be **higher than traditional vaccine technologies**, affecting equitable access in low-income countries.

CONTRIBUTIONS OF KARIKÓ AND WEISSMAN

- Karikó and Weissman made a significant breakthrough in the field of mRNA research. They found that when **lab-grown mRNA** is used for vaccines or therapies, the body's immune cells see it as foreign and **trigger inflammation**.
- To study this, they created **modified versions of mRNA with chemical changes** and tested them on immune cells. They discovered these modifications reduced inflammation, **making mRNA more suitable for medical use**.
- Their findings, published in 2005, were a significant advancement, laying the **groundwork for future mRNA applications**, including COVID-19 vaccines.

Sources:

[Nobel Prize 2023 for Medicine awarded to Katalin Karikó and Drew Weissman for their work in vaccines – The Hindu](#)

Q1. With reference to mRNA vaccines, consider the following statements:

1. These vaccines require the integration of the viral protein into the recipient's DNA.
2. These vaccines stimulate a robust immune response, generating specific antibodies and activating T cells.
3. These vaccines stimulate a robust immune response, generating specific antibodies and activating T cells.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 3 only
- (d) None

Answer: (b)

Q2. Which mechanisms serve as a template for protein synthesis in mRNA vaccines?

- (a) Reverse transcription
- (b) Transcriptional regulation
- (c) Translation of genetic code
- (d) Post-translational modification

Answer: (c)

Q3. Discuss the working mechanism of mRNA vaccines and their advantages in the context of responding to infectious disease outbreaks. How do these vaccines differ from traditional vaccine technologies?

Gaurav