

PERSPECTIVE - LEVERAGING THE POWER OF SCIENCE

Why in news?

- In major industries, the government intends to improve and grow **science and technology infrastructure**.
- **Big Data, Cyber-Physical Systems, Advanced Manufacturing, and Waste Processing** have all been highlighted as prospective platforms with a strong focus on R&D.

Backgrounder

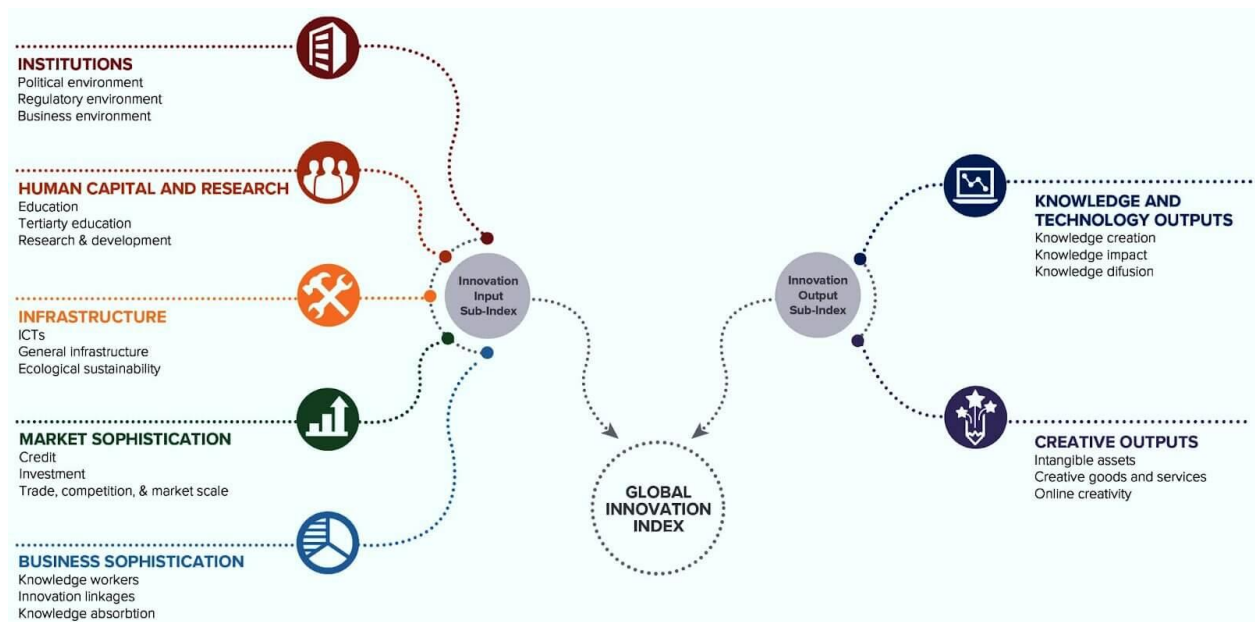
India has achieved great progress in science and technology throughout the years, with the most recent successes visible in the fight against the Covid epidemic. India's development as a knowledge superpower is largely due to its human resource in science and technology. **India has risen in the Global Innovation Index during the last few years, from 81st place in 2015 to 46th place in 2021.** The **Gross Expenditure on Research and Development (GERD)** has been steadily expanding over the previous decade, with India's GERD increasing by three times in gross terms.

What is Global Innovation Index?

- **Professor Soumitra Dutta, while at INSEAD, launched the Global Innovation Index (GII) project in 2007.**
- The purpose was to **develop and determine measures and procedures** that might convey a comprehensive picture of innovation in society.
- **WIPO began working with the GII in 2011** and began co-publishing the publication in 2012.
- **Cornell University, INSEAD, and WIPO** continued to co-publish the GII until 2020.
- WIPO, in collaboration with the Portulans Institute, several business and academic network partners, and the GII Advisory Board, will publish the GII in 2021.
- **Institutions, Human Capital and Research, Infrastructure, Credit, Investment, Linkages, Knowledge generation, Adsorption and Diffusion and creative outputs are all covered by WIPO's innovation criteria.**

Measures calculated:

- **Innovation Input Sub-Index:** The economy's five input pillars capture elements that permit and support creative activities.
- **Innovation Output Sub-Index:** The outputs of inventive activity in the economy are known as innovation outputs. The Output Sub-Index has the same weight as the Input Sub-Index in determining the overall GII scores, although having only two pillars.
- **Overall GII Score:** The average of the Input and Output sub-indices yields the overall GII score, which is then used to generate the GII economy rankings.



Reasons for India's growth:

- The enormous intellectual capital, the **active start-up environment**, and the great work done by public and private research groups are all contributing to the GII ranking's steady development.
- Scientific departments such as the **Department of Atomic Energy, the Department of Science and Technology, the Department of Biotechnology and the Department of Space** have all contributed to the National Innovation Ecosystem's enrichment.
- **NITI Aayog** has been working relentlessly to guarantee that national initiatives to introduce policy led innovation in sectors like **electric vehicles, biotechnology, bio space, alternative energy sources** and others are optimised.
- The **India Innovation Index**, whose most recent edition was released last year by the NITI Aayog, has been generally hailed as a significant step toward decentralising innovation across India's states.
- The NITI Aayog, which includes the GII, has maintained a **steady focus on monitoring and reviewing India's place in worldwide rankings.**

Challenges to Innovation in India:

- **Institute – Industry gap:**
 - Steps like the **Atal Innovation Mission** and collaboration with institutions in **Switzerland and the United Kingdom** are helping but we still have a long way to go before we can close the gap fully.
 - Growth necessitates a **significant shift in the Indian educational system.**
 - Top Indian universities are still **mostly focused on education.**
 - Universities conduct research that is unrelated to **industry or real-world challenges.**

- **Focus on R&D:**
 - India produces **most engineers in the world but the number of innovations and start-ups does not reflect this.**
 - **Interdisciplinary and multinational interactions** are essential to achieve optimum impact and outcomes.
 - Another area where India **lags is research and development spending.**
 - Investments in research are made **on trust, with a modest level of risk.**
- **Building up Infrastructure:**
 - This is an area where India lags behind the rest of the world.
 - The organisers can only provide good and efficient infrastructure if they are aware of the needs of the innovators and scientists.

What is the WIPO?

- It is the **world's largest gathering place for intellectual property (IP) services, policy, information, and collaboration.**
- It is a **United Nations self-funding institution with 193 member nations.**
- The objective is to **drive the creation of a fair and effective international intellectual property system that promotes innovation and creativity for the benefit of all.**
- The WIPO Convention which was founded in **1967** lays forth its mandate governing bodies and procedures.

How is this Index relevant to India today?

- Modern scientists have benefitted from their contributions to **astronomy, mathematics, medicine, metallurgy and chemistry.**
- It is undeniable that **India has made enormous advances in science and technology.**
- India has achieved remarkable progress in science and technology frontier sectors such as **space exploration and atomic energy.**

What is the role of S&T in preventing disaster?

- **Adopting Spatial Technologies:**
 - **Earth observation satellites, communication satellites, meteorological satellites, and global navigation satellite systems (GNSS)** all play important roles in reducing disaster risk
 - These space technologies can provide information about **damaged buildings and hazardous sites that are extremely vulnerable to secondary disasters** in vast urban areas.
 - Land use/land cover patterns can also be determined using space technology, as well as **weather data, crop monitoring, global rainfall monitoring, fire hotspot monitoring, haze monitoring, and drought mitigation measures.**

- **GIS and remote sensing technologies:**

- For both scientific and policy-oriented management, **GIS provides a tool for effective and efficient storage and manipulation of remotely sensed data and other spatial and non-spatial data types.**
- This can be used to simplify the **measuring, mapping, monitoring, and modelling** of a wide range of data types relevant to natural phenomena.
- **Tropical cyclone threat maps are used by meteorological authorities** to increase the quality of tropical storm warning services and swiftly communicate the danger to those who are likely to be affected by the disaster. They can be built for **cities, districts or even the entire country.**
- GIS can be used to more effectively carry out **search and rescue operations by identifying disaster-prone locations and zoning them according to risk magnitudes.**

- **Electronic Communication:**

- The **internet provides a useful platform for disaster mitigation messaging** in today's era of electronic communication.
- It offers a novel and potentially revolutionary method for disseminating disaster information **quickly, automatically, and globally.**
- Numerous individuals and organisations including several national meteorological services are experimenting with the internet to disseminate weather observations, predictions and satellite data in real-time.

- **Early warning signs:**

- The **Area Cyclone Warning Centres (ACWCs) of the Indian Meteorological Department (IMD) give cyclone warnings.**
- It has created the requisite infrastructure to generate and disseminate cyclone alerts at the relevant periods.
- The utilisation of satellite data obtained by the **National Remote Sensing Agency** has substantially aided long-term drought-proofing programmes on the district's natural resources.
- The drought assessment is based on the **National Agricultural Drought Assessment and Management System's comparative evaluation of satellite observed green vegetation cover (both area and greenness) of a district over a given period (NADAMS).**
- The **Central Water Commission (CWC), Ministry of Water Resources issues flood forecasts and alerts.**
- These are used to warn the public about the flood dangers and for concerned administrative and state engineering entities to take proper flood-prevention measures.

Conclusion

It is undeniable that India has made enormous advances in science and technology. In the country, many novel methods, products, and higher-quality goods have been developed. India has achieved remarkable progress in science and technology frontier sectors such as space exploration and atomic energy. The country currently has a strong foundation in modern technology. It also has the world's third-largest scientific and technical workforce.

Mains Question:

Q.) Discuss how Innovation can help in mitigating Disasters and also cite examples adapted in different countries.

Sources:

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