VAJIRAM & RAVI
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The Analyst

CURRENT AFFAIRS Handout

10th June 2025

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Railway Mishaps: What needs to be done?

CONTEXT: In a tragic incident, four passengers died and nine sustained injuries after falling off two separate local trains in Thane district of Maharashtra

Importance of Railways in India - ***'lifeline of the nation'***

Transportation

- Dominant Mode
- Long-distance Travel
- Bulk Goods Movement

Socio-economic Development

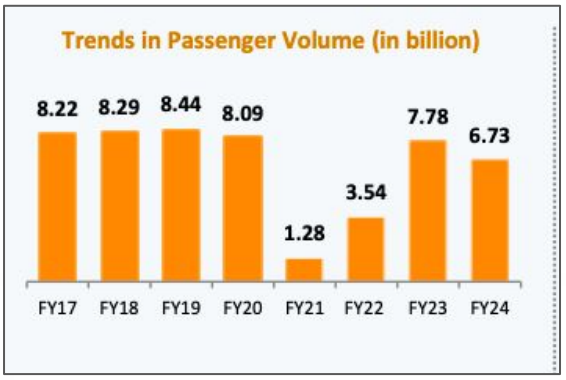
- National Integration
- Market Access
- Employment Generation

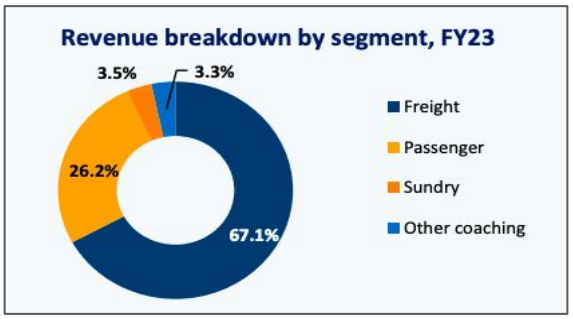
Strategic Importance

- Defense
- Disaster Relief

Recent train accidents

- Triple-train collision in June, 2023
- Freight train, Aurangabad, 2020





Primary causes behind Railway Mishaps?

- **Infrastructure Defects**
  - Poor maintenance, ageing, vandalism, sabotage
  - Much of the infrastructure - 19th and 20th centuries
  - Lack of funds, corruption, inefficiency
  - Operating - over 100% capacity
- **Human Errors**
  - Fatigue, negligence or disregard
  - Results in - wrong signalling, miscommunication
  - Staff lacks adequate training and communication skills
- **Signalling Failures**
  - Technical glitches, power outages
  - Leads to trains running on the wrong track
- **UMLCs**
  - high risk of accidents, 16% of all accidents(2018-19)

What has been done to reduce accidents?

- Rashtriya Rail Sanraksha Kosh
- Technological Upgradation- BMBS, improved suspension design; automatic fire & smoke detection system in coaches, KAVACH.
- LHB Design Coaches- based on German technology; better than conventional ICF design coaches.
- GPS based Fog Pass Device
- Modern Track Structure -PSC, higher UTS rails, etc.
- Ultrasonic Flaw Detection
- Interlocking System- uses electrical or electronic devices to operate the points and signals from a central location
- Elimination of UMLCs

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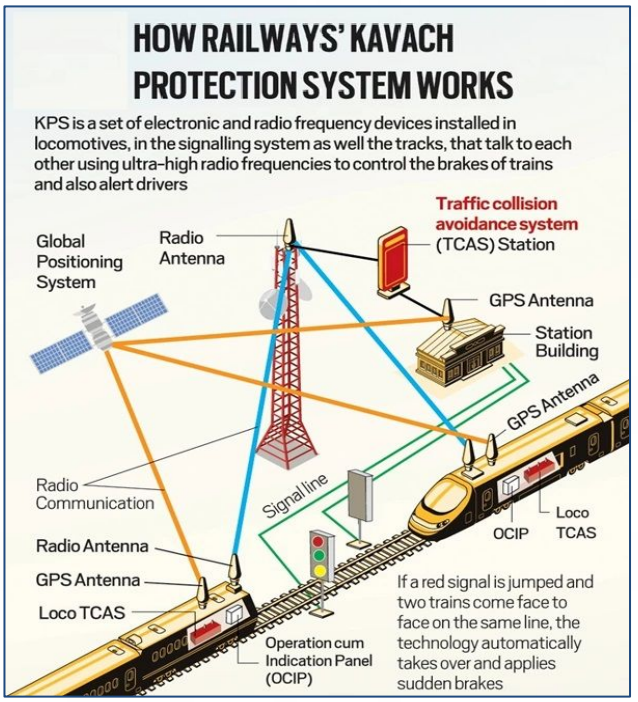
CONTEXT: In a tragic incident, four passengers died and nine sustained injuries after falling off two separate local trains in Thane district of Maharashtra

What should be done to enhance rail safety?

- Investing more in safety-related works
- Regular and comprehensive training to railway staff
- Eliminate Level Crossings - ROBs or RUBs
- Adopt advanced technologies: Installation & strengthening of ACDs(KAVACH)
- Creation of a statutory Railway Safety Authority
- Regular Safety Audits and Inspections
- Enhance Coordination and Communication



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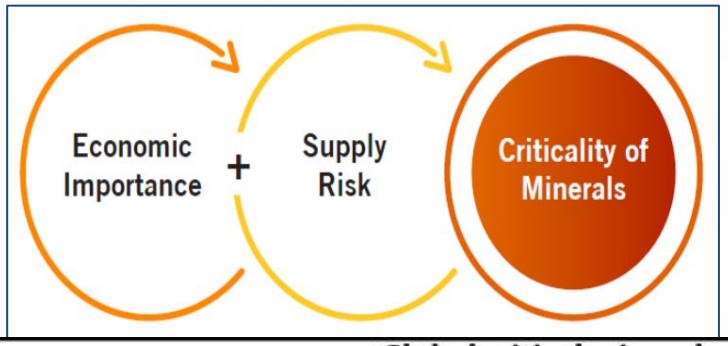
Addressing Shortage of Critical Minerals

CONTEXT: India remains critically dependent on China for REE.

Addressing Shortage of Critical Minerals:

- **'no particular definition'** & 'their own criteria'
- REE - Subset
- These(metallic or non-metallic) have two characteristics
  - **Essentiality**
  - **Supply Chain Risks**
- 'criticality' of minerals - *changes with time*
- **Examples**: antimony, beryllium, bismuth, cobalt, copper, gallium, germanium, lithium, vanadium, etc.
- **Applications:**
  - Used to manufacture advanced technologies
  - Used in low-emission technologies
  - Some also crucial for common products
- **Top Producers**: Chile, Indonesia, Congo, China, Australia, and South Africa.



- **Critical Minerals in India**
  - Ministry of Mines has identified 30 critical minerals
  - Some of them are - Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Lithium, etc.

Significance of Critical Minerals for India

- Economic Development
- National Security
- Environmental Sustainability

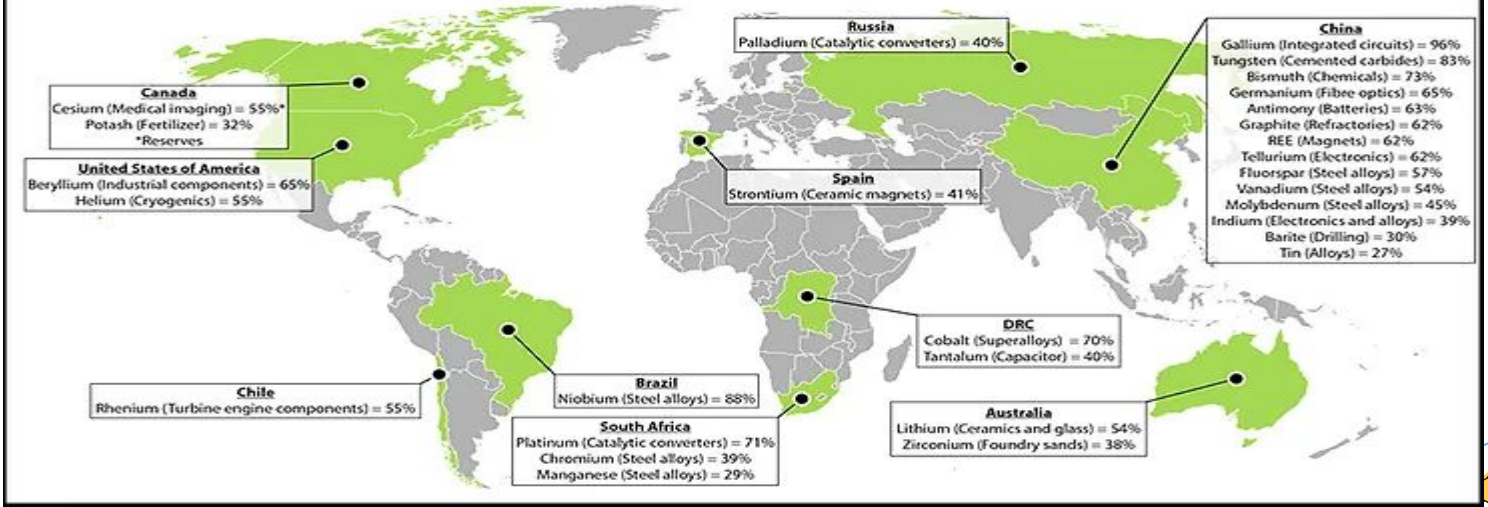
Concerns Related to Critical Minerals in India

- Limited Domestic Reserves
- Increasing Demand for Minerals
- Challenges Posed by China
- Lack of Processing and Manufacturing

Steps Required

- Assessment of the availability and accessibility
- Significant investments in infra, R&D and policy support
- Setting Up a Specialised Body

Global critical mineral production (2019)



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Addressing Shortage of Critical Minerals

CONTEXT: India remains critically dependent on China for REE.

Sl. No.	Critical Mineral	Percentage (2020)	Major Import Sources (2020)
1.	Lithium	100%	Chile, Russia, China, Ireland, Belgium
2.	Cobalt	100%	China, Belgium, Netherlands, US, Japan
3.	Nickel	100%	Sweden, China, Indonesia, Japan, Philippines
4.	Vanadium	100%	Kuwait, Germany, South Africa, Brazil, Thailand
5.	Niobium	100%	Brazil, Australia, Canada, South Africa, Indonesia
6.	Germanium	100%	China, South Africa, Australia, France, US
7.	Rhenium	100%	Russia, UK, Netherlands, South Africa, China
8.	Beryllium	100%	Russia, UK, Netherlands, South Africa, China
9.	Tantalum	100%	Australia, Indonesia, South Africa, Malaysia, US
10.	Strontium	100%	China, US, Russia, Estonia, Slovenia
11.	Zirconium(zircon)	80%	Australia, Indonesia, South Africa, Malaysia, US
12.	Graphite(natural)	60%	China, Madagascar, Mozambique, Vietnam, Tanzania
13.	Manganese	50%	South Africa, Gabon, Australia, Brazil, China
14.	Chromium	2.5%	South Africa, Mozambique, Oman, Switzerland, Turkey
15.	Silicon	<1%	China, Malaysia, Norway, Bhutan, Netherlands

7. About three-fourths of world's cobalt, a metal required for the manufacture of batteries for electric motor vehicles, is produced by

(a) Argentina

(b) Botswana

(c) the Democratic Republic of the Congo

(d) Kazakhstan

Mains Practise Questions:

"Critical minerals are essential for India's economic security and technological advancement. Discuss the significance of critical minerals in the context of India's energy transition and industrial growth. Also, examine the challenges associated with their availability and suggest measures to ensure a sustainable supply."

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Water Harvesting Models

SYLLABUS : GS 3 Paper : Conservation
Newspaper: The Hindu **Page Number: 4**

Mohammed Iqbal
JAIPUR

In the dry heartland of Rajasthan, a transformative rural water conservation model is set to benefit farmers in the upcoming monsoon. Those behind the initiative, which relies on 50 scientifically designed and climate-resilient farm ponds at Kukas village in the State capital of Jaipur, claim it has a 10-crore-litre seasonal monsoon run-off conservation potential.

The village panchayat in Jaipur district's Amber block is the second place in the State selected for the rainwater harvesting enterprise, following the successful installation of farm ponds in the rainfed land of Dausa district. As many as 250 ponds dug in the agricultural land of Dausa have enabled the farmers to get perennial crops.

An aerial view of a farm pond in Jaipur's Kukas village. As many as 50 such ponds have been dug up in the area. SPECIAL ARRANGEMENT

Nearly 99.4% of the agricultural cultivable land in Jaipur is dependent on groundwater for irrigation. The district extracts 2.22 times the water recharged through rain every year. The project in Kukas emphasises the sustainability and livelihoods of peasants, with a focus on the availability of water for irrigation.

The initiative involves constructing 10-foot-deep, plastic-lined ponds on 5% of each farmer's land, reinforced with fencing.

The ponds are designed to capture rainwater, ensuring year-round irrigation for rabi and kharif crops and enabling the return of sustainable livestock rearing and high-value horticulture.

Person behind initiative

An alumnus of the Indian Institute of Technology (IIT), Kharagpur, Vipra Goyal, who has been working with the farmers, said while the construction of 50 ponds had been completed recently, 25 more were being dug to secure sustainable water supply to the rural households, which would help about 50,000 villagers in the region in the long-term.

Farmer Ram Phool of Kacherawala village, near Kukas, told *The Hindu* that he planned to sow crops like groundnuts and chaula (cowpeas) following the inflow of water into the pond installed at a corner of his land spread across eight bighas (nearly five acres). "One has to dig as much as 500 feet to extract groundwater in our area. I was growing bajra earlier as it needs less water," said the 58-year-old farmer.

Kukas sarpanch Radheyshyam Meena said the sustainable irrigation model will help farmers in his area to diversify into cultivating more profitable and water-efficient crops. "The model offered to us has great potential to make farmers self-reliant. They are set to get a better yield with the year-long water supply," said Mr. Meena.

Catching rainwater

Mr. Goyal said 14 lakh to 21 lakh litres of good seasonal monsoon run-off was flowing unutilised at every farm of one hectare in Jaipur. "In areas like Amber block, lacking river and canal networks, farm ponds offer the most viable solution. The continuous irrigation will also help in recharging the groundwater," he said.

The IITian, who had earlier organised awareness programmes about farm ponds through ward sabhas, gram sabhas, and camel cart rallies in Dausa, said the continuous availability of water could pave the way for dairy and food processing units, as well as market linkages for agricultural produce. He has sought the Central government's endorsement to partner with multilateral agencies for grant-based infrastructure and capacity building.

Mr. Goyal previously worked with the NITI Aayog. He has partnered with a two-wheeler manufacturing company to raise funds for the installation of ponds in Kukas.

What are India's Ancient Water Harvesting Systems?

Structure	Description	Region	Key Features
Baoli	**Stepwell structure with arches, carved motifs**, and rooms. Integral to urban water storage in low-rainfall areas.	Rajasthan, Delhi, Gujarat, Karnataka. E.g., Chandi Baori, Rajasthan, Agrasen ki Baoli, Delhi	carvings, rooms, tiered steps, seasonal water collection.
Jhalara	Rectangular stepwells with **tiered steps on three or four sides**, designed to collect water from reservoirs or lakes.	Rajasthan	Tiered steps, rectangular shape.
Talab/Bandhi	**Medium-sized reservoirs**, natural or human-made, regulating water flow and preventing flooding.	Various regions	Reservoirs, water flow regulation.
Taanka	**Cylindrical underground pit** paved to collect rainwater from rooftops or catchment areas.	Thar Desert, Rajasthan	Underground, cylindrical, paved.
Ahar Pynes	**Reservoirs with embankments,** built at the end of diversion channels for harvesting floodwater.	South Bihar	Embankments, floodwater harvesting.
Johads	Earthen storage pits made by excavating **three-sided elevated areas,** with soil used for the fourth side.	Various regions	Earthen pits, elevated area excavation.
Panam Keni	**Cylindrical wells** made with soaked **toddy palm stems**, considered sacred.	Wayanad, Kerala	Cylindrical, sacred, toddy palm stems.
Khadin (Dhora)	**Long earthen embankments** across hill slopes collecting surface runoff for agriculture.	Jaisalmer, Rajasthan	Earthen embankments, surface runoff collection.
Kund	**Saucer-shaped catchment area** with a central circular underground well, traditionally lined with lime and ash.	Various regions across India.	Catchment area, circular well, traditional lining.
Zing	**Small tanks in Ladakh** collect glacier meltwater, turning into streams by afternoon.	Ladakh	Small tanks, glacier water collection.

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Women in Agriculture

SYLLABUS : GS 3 Paper : Agriculture
Newspaper: The Hindu **Page Number:** 6

The United Nations General Assembly has declared 2026 as the International Year of the Woman Farmer, garnering the support of over 100 co-sponsors. The resolution celebrates the essential role of women in global agriculture while raising awareness of their challenges, which include property rights and market access.

This article highlights insights from a symposia on women in agriculture organised by the Royal Norwegian Embassy and the United Nations World Food Programme (WFP) in India (with participation and guidance from the Government of India). It distils the discussions over six months, with 200 participants from diverse fields and backgrounds coming together to address the challenges women in agriculture face.

Some of the observations here also stem from a collaborative project called ENACT, or Enhancing Climate Adaptation of Vulnerable Communities through Nature-based Solutions and Gender Transformative Approaches, in Assam, implemented by the WFP in partnership with the Government of Assam, in Nagaon. The project aims to empower smallholder farmers, particularly women, to access climate-related information and make informed decisions to enhance their resilience. The project is financed by the Government of Norway under its strategy to promote self-sufficiency in food production and strengthen women's rights and their role in food production.

Ownership, control and access

Nearly half the global food supply is made possible by the contributions of women, who are responsible for 60% to 80% of food production in developing countries and account for 39% of the agricultural labour in South Asia. These figures highlight the vital role of women in agriculture, who face barriers and inequalities.

In India, the percentage of women who own agricultural land is significantly lower than that of men, despite women constituting a substantial part of the farm workforce. Approximately 80% of economically active women are employed in agriculture. Yet, only 14% of landowners are women. According to the latest National Family Health Survey, female land ownership is even lower, at 8.3%.

Women farmers in India report that their lack of land ownership makes it difficult to obtain credit and limits their access to financial institutions. Regular access to information on agricultural planning and advisory is essential for farmers, but women have more limited access to technology, such as mobile phones. These obstacles hinder investments, technology adoption and improvements in livelihoods. While microfinance and self-help groups provide some access, such loans are often insufficient for significant investments.

The Government of India supports small women farmers to enhance skills and promote sustainable agriculture. The Mahila Kisan Sashaktikaran Pariyojana upgrades skills and increases resource access for women, while the Sub-Mission on Agricultural Mechanisation offers 50% to 80% subsidies for machinery. Additionally, 30% of the National Food Security Mission's budget is allocated for women farmers in a number of States and Union Territories.

Empowerment for resilience

Climate change disproportionately affects women farmers by increasing their domestic responsibilities and elevating their exposure to agricultural risks. "Our area has been witnessing rapid weather changes. The variety introduced by the project is designed to resist flood damage, and the crops can survive underwater. We are hoping for a better harvest," says Nirmali Bora Hazarika from Roha village in Nagaon.

By engaging with women farmers, it is possible to develop replicable models of climate adaptation at the village and community levels.

The women in agriculture symposia generated forward-looking ideas. The ENACT project primarily connects women farmers with experts through information technology, providing actionable agricultural and climate advisories weekly via their phones to over 300 farmers in 17 villages of Nagaon district.

Additionally, the Climate Adaptation Information Centres facilitate video conferencing and meetings, informing women farmers about agriculture and livelihoods. This shows how scalable impact can be achieved by combining technical expertise, diversification through farm-based livelihoods, information and weather advisories, use of technologies and social behaviour change interventions.

The project is leveraging partnerships with State and district administrations, which include the Department of Agriculture, the State Rural Livelihoods Mission, and the Departments of Meteorology and Environment. The technology partners include agricultural universities, institutions for sourcing climate-resilient crop varieties.

Rural ecosystems and dependent livelihoods are vulnerable. Responses to risks should reflect community needs and capabilities. The ENACT-project emphasises the promotion of flood-resistant rice varieties, livelihood diversification, and market linkages to mitigate crop damage from flooding and promote the cultivation of nutritious local varieties. Women's farmer groups engage in a community-based smart seed production system to enhance sustainability.

Steps to take

Policy design and implementation should take into account the unique needs of women farmers. Granular data with a gender lens are needed to develop solutions tailored to women's needs. These could range from rethinking farming tools to financial needs and practices around saving or credit.

There should be a strong focus on agri-value chains that support women farmers and are managed by women. Part of this could be to enhance women's access to financing mechanisms and information while supporting their collective action and networks, such as women's self-help groups.

We have a historic opportunity to mark 2026 as the International Year of the Woman Farmer, to promote resilient agricultural development and gender equality by recognising, supporting, and enhancing the role of women in ensuring food security, fostering economic prosperity, and promoting sustainability.

World Food Programme (WFP)

✅ **What?**

The World Food Programme is the food-assistance branch of the United Nations, established in **1961**.

✅ **Why?**

To combat global hunger and provide food security in crisis situations.

✅ **Key Functions:**

- Emergency food aid in war zones and disasters.
- School meals to improve children's nutrition and education.
- Support for smallholder farmers and local food production.
- Focus on achieving **SDG 2: Zero Hunger**.

✅ **Recognition:**

WFP was awarded the **Nobel Peace Prize in 2020** for its efforts to combat hunger.

Mahila Kisan Sashaktikaran Pariyojana (MKSP)

✅ **What?**

A sub-component of the **Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM)**, launched in **2010-11**.

✅ **Why?**

To recognize and support **women farmers** (mahila kisan) and ensure their sustainable livelihood and empowerment.

✅ **Key Objectives:**

- Enhance women's participation in agriculture.
- Build sustainable practices in farming.
- Improve access to resources and market linkages.
- Promote agro-ecological practices and reduce drudgery.

✅ **Implementation:**

- Women collectives are formed for training and capacity building.
- Convergence with schemes like MGNREGA, NRLM, and agriculture departments.

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SEZ Norms for Chips & Electronic Units

SYLLABUS : GS 3 Paper : Indian Economy
Newspaper: The Hindu **Page Number: 13**

What is a Special Economic Zone (SEZ) in India?

A **Special Economic Zone (SEZ)** is a specially designated area within a country that has different economic laws and policies compared to the rest of the country, designed to attract investment, boost exports, and create employment.

Here's a **simple explanation**:

✅ **Key Features:**

- SEZs offer **tax breaks** (like exemptions from customs duty, income tax, GST, etc.).
- **Ease of doing business:** Less regulation and more flexibility for companies.
- **Infrastructure:** Good transport, reliable power, and modern facilities.
- **Export-focused:** Products made in SEZs are often aimed at international markets.

✅ **Why SEZs?**

- To promote **exports** and **foreign direct investment (FDI)**.
- To create **jobs** and stimulate economic growth.
- To help industries become more competitive globally.

✅ **Example in India:**

- **Noida SEZ** in Uttar Pradesh.
- **Santacruz Electronics Export Processing Zone (SEEPZ)** in Mumbai.
- Many SEZs focus on IT, manufacturing, biotechnology, etc.

India Semiconductor Mission

Posted On: 23 MAR 2022 3:41PM by PIB Delhi

Government is focused on its important objective of building the overall semiconductor ecosystem and ensure that, it in-turn catalyses India's rapidly expanding electronics manufacturing and innovation ecosystem. This vision of AtmaNirbharta in electronics & semiconductors was given further momentum by the Union Cabinet, chaired by the Hon'ble Prime Minister, approving the Semicon India programme with a total outlay of INR 76,000 crore for the development of semiconductor and display manufacturing ecosystem in our country. The programme aims to provide financial support to companies investing in semiconductors, display manufacturing and design ecosystem. This will serve to pave the way for India's growing presence in the global electronics value chains.

India Semiconductor Mission (ISM) has been setup as an Independent Business Division within Digital India Corporation having administrative and financial autonomy to formulate and drive India's long term strategies for developing semiconductors and display manufacturing facilities and semiconductor design ecosystem. Envisioned to be led by global experts in the Semiconductor and Display industry, ISM will serve as the nodal agency for efficient, coherent and smooth implementation of the schemes.

Following four schemes have been introduced under the aforesaid programme:

i. **Scheme for setting up of Semiconductor Fabs in India** provides fiscal support to eligible applicants for setting up of Semiconductor Fabs which is aimed at attracting large investments for setting up semiconductor wafer fabrication facilities in the country. Following fiscal support has been approved under the scheme:

- 28nm or Lower - Up to 50% of the Project Cost
- Above 28 nm to 45nm - Up to 40% of the Project Cost
- Above 45 nm to 65nm - Up to 30% of the Project Cost

ii. **Scheme for setting up of Display Fabs in India** provides fiscal support to eligible applicants for setting up of Display Fabs which is aimed at attracting large investments for setting up TFT LCD / AMOLED based display fabrication facilities in the country. The Scheme provides fiscal support of up to 50% of Project Cost subject to a ceiling of INR 12,000 crore per Fab.

iii. **Scheme for setting up of Compound Semiconductors / Silicon Photonics / Sensors Fab and Semiconductor Assembly, Testing, Marking and Packaging (ATMP) / OSAT facilities in India:** The Scheme provides a fiscal support of 30% of the Capital Expenditure to the eligible applicants for setting up of Compound Semiconductors / Silicon Photonics (SiPh) / Sensors (including MEMS) Fab and Semiconductor ATMP / OSAT facilities in India.

iv. **Design Linked Incentive (DLI) Scheme** offers financial incentives, design infrastructure support across various stages of development and deployment of semiconductor design for Integrated Circuits (ICs), Chipsets, System on Chips (SoCs), Systems & IP Cores and semiconductor linked design. The scheme provides "Product Design Linked Incentive" of up to 50% of the eligible expenditure subject to a ceiling of ₹15 Crore per application and "Deployment Linked Incentive" of 6% to 4% of net sales turnover over 5 years subject to a ceiling of ₹30 Crore per application.

In addition to the above schemes, Government has also approved modernisation of Semi-Conductor Laboratory, Mohali as a brownfield Fab.

The total fiscal outlay of the proposed schemes is INR 76,000 crore which is fungible across different schemes.

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SEZ Norms for Chips & Electronic Units

SYLLABUS : GS 3 Paper : Indian Economy
Newspaper: The Hindu **Page Number: 13**

What is a Special Economic Zone (SEZ) in India?

The Union government has notified several changes to the regulations for the setting up of special economic zones (SEZs) for the manufacturing of semiconductors or electronic parts. Revisions include reducing minimum plot size for the units and allowing such semiconductor units to also supply to the rest of India, apart from exporting.

Following the notification, the Ministry of Commerce and Industry said, approval has been granted for the setting up of two SEZ facilities in Gujarat and Karnataka at a total investment of ₹13,100 crore.

Promote investments

"Since manufacturing in these sectors is highly capital intensive, import dependent and involves longer gestation periods before turning profitable, rule amendments have been carried out to promote pioneering investments and boost manufacturing in these high technology sectors," the Ministry of Commerce and Industry said in a release.

The amendment to Rule 5 of the SEZ Rules, 2006, has meant an SEZ for the manufacture of semiconductors or electronic components will now need a minimum contiguous land area of 10 hectare, down from earlier 50 hectare.

The amendment to Rule 18 of the SEZ Rules further allows SEZ units in semiconductor as well as electronics component manufacturing to also supply to the rest of India after payment of applicable duties.

Conventionally, SEZs have been export-oriented.

Further, amendment to Rule 7 of SEZ Rules, 2006, allows the Board of Approval for SEZs to relax the norm requiring SEZ land to be encumbrance-free where it is mortgaged or leased to the Central or State government or their authorized agencies.

These amendments were notified by the Department of Commerce on June 3, 2025. Following this, the Board of Approval for SEZs approved the proposals by Micron Semiconductor Technology India and Hubballi Durable Goods Cluster Private Ltd. for setting up SEZs for the manufacture of semiconductors and electronic components respectively.

Micron will establish its SEZ facility in Sanand, Gujarat with an estimated investment of ₹13,000 crore, while Aequs will establish its SEZ in Dharwad, Karnataka, with an estimated investment of ₹100 crore.

"The amendments will boost high-tech manufacturing, spur growth of semiconductor manufacturing ecosystem and create high skilled jobs in the country," the release added.

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Tardigrades

SYLLABUS : GS 3 Paper : Science & Technology
Newspaper: The Hindu **Page Number: 3**

EXPLAINED SCIENCE

ALIND CHAUHAN
NEW DELHI, JUNE 9

AMONG THE scientific experiments astronaut Shubhanshu Shukla will undertake during his two week stay at the International Space Station (ISS) is one that will examine the revival, survival, and reproduction of tardigrades in space.

What is the Voyager Tardigrades experiment? And why do scientists study these microscopic, eight-legged organisms?

First, what are tardigrades?

Tardigrades, also known as "water bears", are robust aquatic animals that have been around for roughly 600 million years, 400 million years before dinosaurs walked the planet. They have survived all the five major mass extinction events to have taken place thus far, and scientists believe they could be around long after humanity has died out.

Typically about 0.5 mm long when fully grown, tardigrades have four pairs of legs, with 4-6 claws on each foot. They also have a specialised mouth which helps them suck nutrients from plant cells, algae, and other small invertebrates.

Tardigrades can be found almost everywhere — from the highest mountains to the deepest oceans. Their most common habitat, however, is the thin film of water found on mosses and lichens, which bestows upon these animals the moniker of "moss piglets".

Tardigrades are also called water bears and moss piglets. *Wikimedia Commons*

Why do scientists study tardigrades?

Although these micro-animals were discovered in 1773 by German zoologist Johann August Ephraim Goeze, they have become a subject of intensive research in the past few decades.

This is because tardigrades are remarkably resilient creatures, known to survive in the harshest of conditions. Water bears have been known to withstand temperatures as low as minus 272.95 degrees Celsius or as high as 150 degrees Celsius; endure ultraviolet radiation of space and pressures of 40,000 kilopascals (equivalent to what can be experienced at a depth of 4 km under the ocean's surface); and live after being stored in a freezer for 30 years, according to a report by *Front Line Genomics*.

A better understanding of tardigrades' survival mechanisms can potentially have several applications: from helping scientists develop more resilient crops to creating advanced sunscreens to preserving human tissues and organs for transplantation.

Why are tardigrades so resilient?

Siddharth Pandey, an affiliate research scientist with US-based Blue Marble Space Institute of Science, told *The Indian Express* that tardigrades owe their incredible resilience to cryptobiosis, a state in which organisms bring their metabolism to a near-complete standstill in the face of adverse environmental conditions. Tardigrades can reduce their metabolism to less than 0.01% of normal, and drop their water levels by more than 95%, a state called anhydrobiosis.

Both anhydrobiosis and cryptobiosis result in the emergence of a durable shrunken state, called tun, in which tardigrades are able to withstand extreme conditions.

Also, these animals produce unique proteins such as cytoplasmic-abundant heat soluble (CAHS) proteins which are key to their resilience. "These [proteins] form a gel-like matrix within their cells, vitrifying and protecting essential cellular components from destruction. This allows them to withstand extreme temperatures, radiation, and the vacuum of space," Pandey said.

What does the Voyager Tardigrades experiment seek to do?

Scientists will take tardigrades to the ISS in a state of tun, before reviving them and examining the effects of space radiation and microgravity on their biological processes.

The primary objective of the experiment is to identify the genes that are responsible for making these animals resilient. In other words, scientists hope to pinpoint the specific molecular machinery that enables tardigrades' survival and DNA repair in space.

This will help scientists develop strategies to protect astronauts during long-duration space missions, and preserve biological materials for extended space travel.

For instance, the survival mechanisms of tardigrades can be used to come up with strategies that better shield astronauts from space radiation, or counteract muscle and bone density loss experienced during lengthy space stays.

Have tardigrades been taken to space before?

Tardigrades have been a part of space missions since 2007, when some 3,000 moss piglets hitched a ride to space aboard the European Space Agency's Foton-M3 mission.

The tardigrades, in a state of tun, were kept in a little round box on the side of the spacecraft whose lid was opened in space. Upon returning to Earth, they were rehydrated and examined. The German and Swedish scientists undertaking the experiment found that not only did many water bears survive the harsh space environment, some were also able to reproduce successfully.

"While exposure to UV radiation did cause some damage and reduce survival rates slightly, the experiment confirmed that the vacuum of space alone was not a barrier to their survival, solidifying their status as one of Earth's most durable organisms," Pandey said.

The experiment also made tardigrades the first animal to survive exposure to space. Before water bears, animals had only survived space in the safety of a spaceship or space suit.

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Robust De-addiction Centres

SYLLABUS : GS 2 Paper : Health
Newspaper: The Hindu **Page Number: 4**

The Hindu Bureau
CHANDIGARH

The Cabinet subcommittee set up by the Punjab government to "wage a war against drugs" decided on Monday to establish a robust system for the treatment of drug addicts amid an increase in the number of drug addicts seeking treatment at government de-addiction centres and hospitals, State Finance Minister Harpal Cheema said.

He said this crucial step comes as the ongoing campaign against the drug menace has successfully disrupted drug supply lines, leading to a notable increase in individuals seeking treatment.

"With an increasing number of drug addicts seeking treatment at government de-addiction centres and hospitals, the subcommittee has moved swiftly to expand capacity and enhance medical support. Decisions include the immediate recruitment of 200 psychologists on a temporary basis for six months, with the Health Department tasked to secure permanent recruitment in the interim," he said, addressing a press conference here.

Over 16,000 arrests

The subcommittee has also directed the Health Department to submit a comprehensive proposal within a week for recruitment of all necessary health staff, he added.

The Finance Minister said as part of the 'war against drugs' campaign from March 1, 2025, till June 8, as many as 9,580 cases were registered under the Narcotic Drugs and Psychotropic Substances Act and 16,348 people have been arrested.

About Narcotics Control Bureau (NCB):

- It is the **nodal drug law enforcement and intelligence agency** under the **Ministry of Home Affairs,** Government of India.
- It was **constituted** on 14th November, 1985, **under** the **provisions of the Narcotic Drugs and Psychotropic Substances Act, 1985** (NDPS Act).
- It has its **headquarters** located in **Delhi**.
- The NCB exercises the **powers and functions** of the Central Government for taking measures with respect to:
  - **Co-ordination of actions by various offices**, State Governments, and other authorities **under the N.D.P.S. Act, Customs Act, Drugs and Cosmetics Act,** and any other law for the time being in force in connection with the enforcement provisions of the NDPS Act, 1985.
  - **Implementation of the obligation** in respect of countermeasures against illicit traffic **under the various international conventions and protocols** that are in force at present or which may be ratified or acceded to by India in the future.
  - **Assistance to concerned authorities in foreign countries and** concerned **international organisations to** facilitate coordination and universal action for prevention and suppression of illicit traffic in these drugs and substances.
  - **Coordination of actions taken by** the **other concerned ministries, departments,** and organizations in respect of matters relating to drug abuse.
- It also **functions as an enforcement agency through** its **zonal offices.**
- The **zonal offices collect and analyse data** related to seizures of narcotic drugs and psychotropic substances, **study trends,** modus operandi, **collect and disseminate intelligence,** and **work in close cooperation with the Customs, State Police,** and other law enforcement agencies.

The Analyst Handout

10th June 2025

Daily Quiz

Q1. Consider the following Minerals :

1. Antimony
2. Beryllium
3. Cobalt
4. Copper
5. Gallium

How many of the above minerals are considered critical minerals?

a) Only Two
b) Only Three
c) Only Four
d) All Five

Answer: d

Q2. In the context of ancient Indian history, what do the terms "Baoli, Jhalara & Bandhi" stand for:

a) Folk literature
b) Different methods of irrigation
c) Water conservation system
d) Textile Products

Answer: c

Q3. Consider the following statements :

1. The United Nations General Assembly has declared 2027 as the International Year of the Woman farmer
2. The resolution celebrates the essential role of women in global agriculture

Which of the above-given statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Answer: b

Q4. Consider the following statements regarding the Special Economic Zone (SEZ) :

1. It is a specially designated area within the country with different economic laws and policies than the rest.
2. It aims to promote exports and Foreign Direct investments in the country.
3. The products made in SEZ especially target the needs of the domestic market.

Which of the statements given above is/are correct?

a) 1 and 2 only
b) 3 only
c) 1 and 3 only
d) 2 only

Answer: a

Q5. Consider the following statements regarding Tardigrades:

1. They are robust aquatic animals that have survived all five major mass extinction events.
2. They extract nutrients from plant cells, algae and other small invertebrates.

Which of the statements given above is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Answer: c

VAJIRAM & RAVI

Institute for IAS Examination

A unit of Vajiram & Ravi IAS Study Centre LLP

9-B, Bada Bazar Marg, Old Rajinder Nagar,
New Delhi - 110060 • Ph.: 41007400, 41007500

New No. 62, P Block, 6th Avenue, Anna Nagar,
Chennai - 600040 • Ph.: 044-4330-2121
Visit us at : www.vajiramandravi.com