UPSC Daily Current Affairs| Prelim Bits 23-04-2025

Comprehensive Remote Sensing Observation on Crop Progress (CROP)

Prelims – *Current events of national and international importance.*

Mains (GS III) – *Science and Technology- developments and their applications and effects in everyday life | e-technology in the aid of farmers.*

Why in news?

Recently ISRO has estimated the total wheat production from eight major wheat-growing states using Comprehensive Remote Sensing Observation on Crop Progress (CROP).

- **CROP** – It is a *semi-automated and scalable framework* developed by ISRO's National Remote Sensing Centre (NRSC).
- **Function** – It enables near real-time monitoring of crop sowing and harvesting during the ***Rabi season*** across India.
- **Data sources** – The framework uses remote sensing datasets of *Optical sensors and Synthetic Aperture Radar (SAR)* from multiple satellites,
  - EOS-04 (RISAT-1A)
  - EOS-06 (Oceansat-3)
  - Resourcesat-2A
- Optical sensors capture visible and near-infrared light, SAR uses microwaves to create images, offering all-weather information.
- **Methodology** – The system assimilates several satellite-derived parameters into a process-based crop growth simulation model using,
  - Crop area measurements
  - Sowing date information
  - In-season crop condition data by assessing the health and development of crops during their growth cycle.

> *A process-based crop growth simulation model is a tool that imitate the growth and development of crops by modelling the fundamental processes that govern plant growth and development.*

- It uses these inputs along with *additional parameters like weather data, soil conditions, and crop-specific growth characteristics* to imitate how the crops develop over time and predict yield and production.
- A remote sensing-based *Vegetation Health Index (VHI)* has been employed to monitor crop conditions and drought stress.
- **Major wheat producing states in India** – The 8 major wheat-growing states covered

in the assessment are Uttar Pradesh, Madhya Pradesh, Rajasthan, Punjab, Haryana, Bihar, Gujarat and Maharashtra.

- **Significance - Enhances Agricultural Policy Development**- Assists the Ministry of Agriculture with real-time monitoring of agricultural activities.
- **Strengthens Food Security** - Timely yield predictions facilitate effective food stock management and procurement strategies.
- **Supports Disaster Response** - Contributes to assessments of the impacts of droughts, floods, and pest infestations.
- **Fosters Technological Advancement -** Encourages the adoption of space-based precision agriculture and the integration of remote sensing in farm management.

Reference

The Hindu| ISRO satellites forecast wheat production

Jal Jeevan Mission (JJM)

Prelims – *Current events of national importance*

Mains (GS II) – *Government Policies & Interventions*

Why in News?

Jal Shakti Ministry seeks Rs 2.79 lakh crore more for Jal Jeevan Mission.

- **Aim -** To provide ***Functional Household Tap Connections (FHTC)*** to provide 55 lpcd (litre per capita per day) drinking water to all rural households in the country by 2024.
  - 75% of the target achieved over 5 years, so extended till 2028.
- **Launched in -** August 2019.
- **Nodal Ministry -** Ministry of Jalshakti.
- **Funding -** Centrally Sponsored Scheme.
- **Pattern between Centre and State**
  - 90:10 - Himalayan (Uttarakhand, Himachal Pradesh) and North-Eastern States.
  - 100% -Union Territories.
  - 50:50 - rest of the States.
- **Components**

- **Objectives -** Prioritizing FHTC provision in quality-affected areas, drought-prone regions, desert areas, and Sansad Adarsh Gram Yojana (SAGY) villages.
- Ensuring functional tap connections in schools, Anganwadi centers, gram panchayat buildings, health and wellness centers, and community buildings.
- Monitoring the functionality of tap connections.
- Promoting voluntary ownership among the local community through contributions in cash, kind, or labor (shramdaan).
- Ensuring the sustainability of water supply systems, including water sources, infrastructure, and funding for regular operations and maintenance.
- Empowering and developing human resources in the water sector, covering construction, plumbing, electrical work, water quality management, water treatment, catchment protection, and more.
- Raising awareness about the significance of safe drinking water and involving stakeholders to make water everyone's responsibility.

Reference

The Indian Express | Jal Jeevan Mission

LEDA 1313424, Bullseye Galaxy

Prelims – *Current events of national and international importance*

Mains (GS III) – *Science and Technology- Awareness in the fields of Space*

Why in News?

A team of international researchers recently discovered a galaxy with nine rings, named Bullseye.

- It is a collisional ring galaxy discovered recently by *NASA's Hubble Space Telescope.*
- **Size -** It is nearly ***2.5-times larger than the Milky Way*** with a diameter of 250,000 light-years.
- **Type -** Spiral galaxy.
- A blue dwarf galaxy, positioned at the center-left of the image, is believed to have interacted with the Bullseye Galaxy approximately 50 million years ago.
    - It results in the distinctive shape of the Bullseye Galaxy.
- A *thin trail of gas* connecting the two galaxies even though they are separated by 130,000 lightyears (or 1.22 billion billion km).
- The blue dwarf galaxy's straight path through the Bullseye Galaxy caused gas in the latter to *ripple back and forth in waves*, creating new places of star formation.
- The interaction didn't alter the orbits of individual stars but it caused groups of stars to pile up and form the distinct rings over millions of years.
- Bullseye hosts a lot of neutral hydrogen gas, considering its mass in stars.
- That reservoir of star-forming material is similar to known *low surface brightness galaxies*, strengthening the notion that collisional ring galaxies evolve into these fainter objects as their rings fade.
- The Bullseye Galaxy will continue to evolve and, as a result, will have these star-filled rings only for a short interval of time.
- This means the astronomers captured an intriguing image of a multi-ring galaxy in a special moment.
- Bullseye Galaxy also contains signs that it could one day evolve into a giant low surface brightness (GLSB) galaxy, which are important in the study of dark matter.

> *Giant low surface brightness (GLSB) galaxies are the largest of the low surface-brightness galaxies. All GLSB galaxies are truly colossal.*

Reference

The Hindu | Bullseye Galaxy

Ramsar Sites in India

Prelims – *Current events of national importance*

Mains ***(GS I & III)*** - *Distribution of Key Natural Resources*| *Conservation*

Why in News?

Secretary General of the Ramsar Convention on Wetlands, Dr. Musonda Mumba, recently said that India (89) has more Ramsar sites compared to China (82).

- Ramsar sites are ***wetlands of international importance*** designated under the ***Ramsar Convention.***

Ramsar Convention is an international treaty that promotes the conservation and wise use of wetlands came into force in 1975.

- They are crucial for biodiversity conservation, water quality, and climate regulation.
- The wetland sites range from mountains to the sea.
- Wetlands are referred to as the ***"Kidneys of the Earth".***

In India

- At Present, India has 89 Ramsar sites, covering 8% of total wetlands area in India.

Newly Added Ramsar Sites, 2025	
Udhwa Lake	Jharkhand
Theerthangal	Tamil Nadu
Sakkarakottai	Tamil Nadu
Khecheopalri	Sikkim

- **Significance -** Wetlands represent the largest carbon reservoirs on the planet.
- They play a crucial role in purifying and filtering contaminated water.
- The availability of food is closely linked to the health of wetlands.
- Additionally, wetlands help to reduce the impact of extreme weather events.
- They also create employment opportunities and support sustainable livelihoods.
- Nearly half of all animal species rely on wetlands for their habitat and reproduction.

Wetland Conservation in India

- **Wetlands of India Portal-** Launched on October 2, 2021, by the Ministry of Environment, Forest, and Climate Change (MoEFCC), this portal provides comprehensive information on India's wetlands.
- **National Wetland Decadal Change Atlas -** Prepared by the Space Applications Centre (SAC), Ahmedabad, this atlas highlights the changes in wetlands across the country over the past decade.
- **Centre for Wetland Conservation and Management (CWCM)** - Established in 2021, this center focuses on addressing research needs and knowledge gaps in wetland conservation.
- **Wetlands Rejuvenation Program -** Initiated by MoEFCC in 2020, this program aims to rejuvenate wetlands across India.
- **Integration with River Basin Management -** The Namami Gange program integrates wetland conservation with river basin management, serving as a model framework for the entire country.
- **National Plan for Conservation of Aquatic Ecosystems -** In 2013, the National Wetlands Conservation Program and the National Lake Conservation Plan were combined to create the National Plan for Conservation of Aquatic Ecosystems.
- **Amrit Dharohar Scheme -** Key initiative aimed at optimizing wetland utilization.

- **MoEFCC's Wetlands Rejuvenation Program** - Launched in 2020, the Ministry of Environment, Forest & Climate Change (MoEFCC) initiated the Wetlands Rejuvenation Program.
- **National Wildlife Action Plan -** The National Wildlife Action Plan (2017-2031) emphasizes the conservation of inland aquatic ecosystems, including wetlands.
- It advocates for a national wetlands mission to preserve these habitats, recognizing their importance for biodiversity and ecosystem services.
- **Integration with Namami Gange -** On World Wetlands Day 2021, the Ministry of Jal Shakti highlighted the integration of wetland conservation with the Namami Gange program.
- The National Mission for Clean Ganga (NMCG) has pioneered initiatives that serve as models for wetland conservation nationwide.
- This includes developing health cards and management plans for 10 wetlands in each of the 50-plus Ganga districts, blending scientific expertise with community involvement.

Reference

The Hindu | Ramsar sites

Perovskite Solar Cells

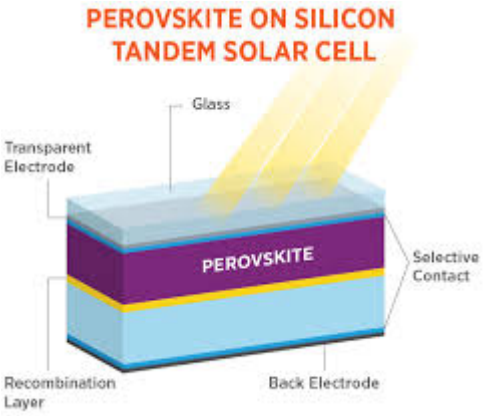
Prelims – *Current events of national Importance | General Science.*

Mains (GS III) – *Science and Technology- developments and their applications and effects in everyday life.*

Why in news?

Recently scientists have developed a water-based recycling solution for perovskite solar cells.

- **Perovskite solar cells** – A perovskite solar cell is a third-generation solar cell that employs a *metal halide perovskite* compound as a light absorber.
- Perovskite solar cells are made up of multiple layers.
- The perovskite layer can conduct and transport charges is *sandwiched between metal electrodes and glass sheets*.
- They are a class of semiconductor materials are known for their *unique optical, superconductivity and electronic properties*.



Metal halide perovskites (MHPs) were first discovered by Russian mineralogist L. A. Perovski.

- **Advantages** – They are cheaper to produce than silicon-based solar panels and offer higher efficiency in energy conversion.
- **Disadvantages** – But they *contain toxic elements* like lead that require careful disposal and have *shorter lifespans* than traditional solar panels.
- Perovskite materials are ***extremely unstable*** towards ambient (humidity and oxygen) conditions that restrict their commercialisation.
- **Recycling** – The components of the solar cells are recycled to minimize the emission and lower cost associated with solar energy generation.
- By recycling the components of a perovskite solar cell can be used for as long as possible, to minimise waste and promoting circular economy.
- Currently they are recycled using the ***toxic organic solvents***.

The new water-based recycling process

- Dissolving and recycling the lead-containing perovskite layer in water was a major challenge to overcome.
- For this, the scientists added three key salts to help in the recycling process.
- **Sodium acetate** –It binds with lead ions in solar cells to form ***lead acetate***, which is easily soluble in water.
- **Sodium iodide** – It helps in *repairing and restoring* degraded perovskite compounds.
- **Hypophosphorous acid** – It acts as a *long-term stabilizer*.

Stabilizer is a substance that either prevents or slows down reactions, thus enhancing the stability of a system.

- **Ethanol and ethyl acetate solutions** – They are also used to dissolve other components.
- **Results of the new method** – Scientists recovered approximately 99% of different layers after multiple recycling rounds.
- Recycled materials-maintained efficiency comparable to fresh materials even after five recycling cycles.

Quick facts

Carbon-based perovskite solar cells

• Indian scientists have indigenously developed highly stable, low-cost Carbon-based perovskite solar cells with superior thermal and moisture stability.
• The sensitivity of perovskite materials toward humidity and thermal stress is a major obstacle for practical implementation.
• Carbon-based perovskite solar cells (CPSCs) have been successful in minimizing device stability issues.
• It also reduces the fabrication costs.

Reference

The Hindu| Perovskite Solar Cells

One Liners 23-04-2025

Geography

Lyrid Meteor Shower, 2025

India is set to witness the Lyrid Meteor Shower, 2025, an annual event known for bright meteors and fireballs, occurring every April, which is expected to peak on the night of April 21 into the early hours of April 22.

• It is one of the oldest recorded celestial events in human history, with observations dating back over 2,700 years.
• It occurs when the Earth passes through debris from Comet C/1861 G1 (Thatcher).
• **Comet C/1861 G1 (Thatcher)** – It is a sand-sized fragments burn up in the atmosphere, creating meteors. Typically, 10-20 meteors per hour are seen at its peak, with occasional outbursts and lingering dust trails.
• **Observation** – To maximize viewing, find a dark location with a clear view of the northeastern sky and the naked eye is sufficient to enjoy this cosmic display.
• **Viewing locations** – Hill stations, remote areas in Himachal Pradesh, Uttarakhand, Rajasthan, and the Northeast, national parks, and rural countryside with a clear northeastern horizon are ideal.

Polity & Governance

Maharashtra Mandates Hindi as Third Language

Recently, Maharashtra school education department has announced a significant reform under the National Education Policy (NEP) 2020.

• **Aim** – To promote multilingualism and strengthen national integration.
• This move aligns with NEP 2020's 3-language formula.
• **3-language formula** – Hindi will become a mandatory third language for students in Classes 1 to 5 in English and Marathi-medium schools starting from the academic year 2025–26.
• **Shift from 2-Language system** – This new directive marks a departure from the existing two-language format prevalent in Marathi and English-medium schools.
• **New Education Structure** – This change is in accordance with NEP 2020's recommended 5+3+3+4 education structure, specifically impacting the Foundational and Preparatory stages.

Law Commission of India

Recently, Justice Dinesh Maheshwari, a former Supreme Court judge, was appointed as the Chairperson of the 23rd Law Commission of India in April 2025.

• **Established in** – 1834, under the Charter Act of 1833, with Lord Macaulay serving as its chairman.
• **Law Commission** – It is a non-statutory advisory body, established by a notification from the Ministry of Law and Justice for a specific tenure to conduct legal research for reforms.
• **23rd Law Commission** – It is primarily responsible for examining and recommending reforms in Indian law, with a notable emphasis on the contentious Uniform Civil Code (UCC).
• **Key Functions** – Reviewing and recommending the repeal of outdated laws.
  - Examining laws affecting the poor
  - Proposing new legislation aligned with constitutional principles
  - Reviewing judicial administration matters referred by the government.

Economy

Green Crypto Initiative

Recently, Bhutan is venturing into mining green cryptocurrency using its abundant hydropower resources to stimulate its economy and address youth emigration.

• **Green Cryptocurrencies** – They are digital currencies mined using renewable energy sources, such as hydropower, wind, or solar, ensuring a lower environmental impact than traditional mining.
• **Aim** – To provide environmentally friendly digital assets for companies striving to meet their Environmental, Social, and Governance (ESG) objectives.
• The adoption of green cryptocurrency mining aligns with Bhutan's Gross National Happiness (GNH) philosophy, which prioritizes sustainable development and environmental preservation.
• **Key attributes** – Bhutan's green cryptocurrency mining leverages 100% hydropower, resulting in carbon-neutral operations and supporting blockchain technology with a minimal ecological footprint.
• **Economic impact** – This move positions Bhutan as a potential global leader in green digital finance, allowing it to capitalize on its existing hydropower infrastructure for economic diversification and growth.

Agriculture

ISRO Forecasts Wheat Production

Recently, ISRO's CROP framework has projected India's wheat production for the Rabi season 2024-25 at 122.724 million tonnes across eight key wheat-growing states.

• **CROP Framework** – Comprehensive Remote Sensing Observation on Crop Progress (CROP) is a semi-automated, scalable system for near real-time monitoring of crop stages.
• **Developed by** – ISRO's National Remote Sensing Centre (NRSC).
• **Aim** – To provide systematic, timely, and scalable agricultural crop monitoring using satellite data for accurate condition assessments and improved planning.
• **Features** – CROP utilizes optical and SAR data from satellites like EOS-04, EOS-06, and Resourcesat-2A. It maps wheat distribution over 8 lakh hectares and integrates crop simulation models with multi-source data fusion for enhanced precision.
• **Significance** – It supports the Ministry of Agriculture in real-time agricultural monitoring, aiding in informed agri-policy making and strategic interventions.
• It assists in disaster assessment and promotes the integration of space-based precision agriculture.

Environment

Novel Archaeal Species

Recently, researchers have identified a new novel archaeal species Methanobrevibacter Intestini, offering insights into human-microbiome interactions.

• It is a new archaeon species produces methane and succinic acid, a compound linked to inflammation.

***Archaea** are a unique life domain, separate from bacteria and eukaryotes, with distinct cellular and metabolic characteristics.*

• **Methanogens** – It is a subgroup of archaea, produce methane and are increasingly recognized as important components of the human gut microbiome.

• **Discovery of Methanobrevibacter smithii Variant** – It is named as GRAZ-2, which was isolated and found to produce formic acid, potentially disrupting other gut microbes.

• **Implications for microbiome dynamics** – The discovery of GRAZ-2 highlights the complex interactions within the gut microbiome and their potential influence on human health.

Security

New Hydrogen-Based Explosive

Recently, China has successfully tested a 2-kilogram hydrogen-based explosive device, showcasing non-nuclear military potential.

• **Developed by –** China State Shipbuilding Corporation's (CSSC).

• **Explosive capabilities** – The device produces a white-hot fireball lasting over two seconds, 15 times longer than TNT, and reaches temperatures exceeding 1,000 degrees Celsius, enabling extensive thermal damage.

• It utilizes magnesium hydride as its key material.

• **Mechanism of sustained detonation** – It causes magnesium hydride to decompose, releasing and igniting hydrogen.

• The blast shatters the hydride, with fragments continuing to release hydrogen, creating a self-sustaining explosion and allowing for controlled intensity.

• **Military Applications** – This weapon can be used to clear dispersed forces or target high-value assets like bridges and fuel depots.

• China has established a mass production facility for magnesium hydride in Shaanxi.

Science

Digital Connectivity in Ladakh

Recently, Indian Army has successfully provided 4G and 5G mobile connectivity to remote border communities in Ladakh, including challenging terrains and the Siachen Glacier.

• **Aim** – To uplift remote border villages by fostering local economies, promoting tourism, and improving access to vital services.

• **Collaboration** – The Army collaborated with Telecom Service Providers and Ladakh administration, utilizing optical fiber infrastructure to install mobile towers, including a 5G tower in Siachen.

• **Coverage** – The mobile network extends to strategically important and remote areas like Galwan Valley, DBO, Chumar, Batalik, and Dras, enhancing connectivity near the LAC.

• **Significance** – This initiative addresses the critical need for improved communication in high-altitude areas, particularly for troops facing isolation and harsh conditions.

• It sets a precedent for future infrastructure projects in remote areas, highlighting the importance of digital connectivity in national development and improving lives in high-altitude regions.

New World Screwworm (NWS) Myiasis

NWS myiasis, recently detected in Mexico which is a parasitic infection caused by Cochliomyia hominivorax larvae, primarily affecting livestock but occasionally humans.

• **Development of infection** – It occurs when screwworm fly larvae infest warm-blooded animals. Female flies lay eggs in open wounds, which hatch into larvae that burrow into living tissue, causing significant damage.

• **Symptoms** – Presence of maggots in wounds, unhealing and painful lesions with bleeding, a foul odour, and potential secondary infections leading to fever or chills.

• **Higher risk** – Those travelling to endemic regions (South America, Caribbean), individuals with open wounds, weakened immune systems, or those around livestock are at increased risk of infection.

• **Transmission** – It spreads when female screwworm flies are attracted to open wounds and lay eggs. Hatched larvae then burrow into the tissue, establishing an infestation.

• **Prevention** – Keeping wounds clean and covered, using insect repellents, wearing protective clothing, and sleeping in screened areas.

• **Treatment** – It requires professional medical intervention for the physical removal of larvae, often surgically.

Miscellaneous

Pope Francis

Recently, Pope Francis, aged 88, has passed away following a prolonged illness, including a recent bout of double pneumonia, as announced by the Vatican.

• **Historic Papacy** – The first Latin American and Jesuit pope, Francis's reign was defined by reform, compassion, controversy, and a strong commitment to social justice.

• **Born on** – 1936, Jorge Mario Bergoglio in Buenos Aires, he was the son of Italian immigrants, known for his simple lifestyle and advocacy for the poor.

• Francis became the first pope from the Americas, the first Jesuit pope, and the first non-European pope in over 1,200 years.

• **Election** – His election marked a significant moment for the Catholic Church, symbolizing its efforts to renew itself and embrace global diversity.

• **Lasting legacy** – Pope Francis leaves behind a legacy of significant reforms and a profound impact on the Church and the world, characterized by his dedication to the marginalized and his efforts to modernize the Church.