



FORTUNE WEEKLY DIGEST



› Aviation Safety

› SpaDex

› Groundwater Contamination

31st DECEMBER, 2024 - 05th JANUARY, 2025

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EDITOR'S NOTE

As UPSC aspirants, it is essential to stay updated on current affairs to excel in the examination. This **Fortune Weekly Digest (ForWarD)** brings you the latest news and developments from around the world, carefully curated and analyzed to help you prepare for the Civil Services (Main) Examination.

We understand that time is precious, and we have made sure to present the information in a concise and easy-to-understand manner.

The magazine is divided into different sections. Mains relevant topics have been covered in detail with a UPSC previous year question perspective. The jot downs are examples and interesting facts to enrich your answer writing. Cherrypicks has some key words from the week, helpful again in answer writing and essay. We have also included essay topics and sample questions to help you gauge your preparation.

We have designed this magazine to best supplement the daily current affairs notes we have launched by the name of **FIND (Fortune IAS News Daily)** and **FINDER (Fortune IAS News Daily Explainer)** and the **Fortune Prelims Precise** monthly compilation. This magazine will be explained in detail and your queries addressed in a live class we conduct.

At a time when there is no dearth of current affairs materials, our hope is help you get a one-stop solution for all your current affairs needs.

This magazine is a work in progress and your feedback will be appreciated.

We hope that this magazine will serve as a valuable resource for your exam preparation and contribute to your success in the UPSC examination.

INDEX

Aviation Safety	1
SpaDex (Space Docking Experiment)	5
Groundwater Contamination	8
India Bangladesh Extradition Treaty	11
Weekly Dossiers	14
Kurukshetra - November 2024	17
Ethics - Case Study	25
Ethics - Examples	25
Model Essay	26
Mains Jot Down	27
Cherrypicks of the Week	29

**FIRST ATTEMPT TOPPERS FROM
OUR PRELIMS CUM MAINS BATCH**



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AVIATION SAFETY

Syllabus: GS III - Infrastructure

PYQ MAPPING

Q1 International civil aviation laws provide all countries complete and exclusive sovereignty over the airspace above the territory. What do you understand by airspace? What are the implications of these laws on the space above this airspace? Discuss the challenges which this poses and suggests ways to contain the threat. (2014)

Q2 Examine the developments of Airports in India through Joint Ventures under Public- Private Partnership(PPP) model. What are the challenges faced by the authorities in this regard (2017)

SHORT TAKES

- **International Civil Aviation Organisation (ICAO):** A UN specialised agency established in 1944 after the Chicago Conference, sets global standards for aviation safety, security, efficiency, and environmental protection. With 193 member states, it includes India as a founding member.
- **International Air Transport Association (IATA):** Founded in 1945, represents over 340 airlines from 120 countries, promoting safe, secure, and efficient air transport through industry standards and advocacy.
- **Directorate General of Civil Aviation (DGCA):** An attached office of Ministry of Civil Aviation, it regulates air transport services, enforces civil air regulations, and ensures airworthiness and safety standards in India

RECENT INCIDENTS

➡ Jeju Air Crash (South Korea)

- **Date:** December 29, 2024.
- **Incident:** Belly-landing, runway overshoot, perimeter wall crash, and fire.
- **Casualties:** 179 out of 181 passengers killed.
- **Cause:** Initial reports suggest a bird strike.
- **Aircraft:** Boeing 737-800.

➡ KLM Incident (Norway)

- **Date:** December 29, 2024.
- **Incident:** Aircraft veered off the runway and stopped near the sea.
- **Casualties:** No injuries reported.
- **Aircraft:** Boeing 737-800.

➡ Air Canada Incident (Canada)

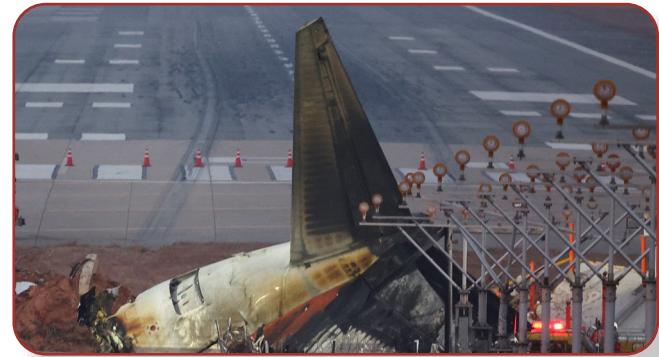
- **Date:** December 29, 2024.
- **Incident:** Suspected landing gear issue; wingtip scraped runway, causing a fire.

WHY IN NEWS

Jeju Air flight 7C2216 crashed at Muan International Airport in South Korea, killing 179 people after making a belly-landing and bursting into flames. The incident, involving a Boeing 737-800, is the deadliest air crash in South Korea, with only two survivors, both cabin crew members.

INTRODUCTION

Aviation safety is a critical aspect of the global transportation industry, aimed at **minimising risks and ensuring secure air travel for passengers and crew**. Despite significant technological advancements, systemic challenges, regulatory lapses, and human errors continue to pose threats to aviation safety, underscoring the need for constant vigilance and reform.



- **Casualties:** No injuries.

- **Aircraft:** De Havilland Dash 8.

➡ Azerbaijan Airlines Crash (Azerbaijan)

- **Date:** December 25, 2024.
- **Incident:** Aircraft shot down on Baku-Grozny(Russia) route.
- **Political Fallout:** NATO blamed Russia; Ukraine alleged Russian involvement.
- **Aircraft:** Embraer 190AR.

➡ Air India Express Crash (Kozhikode, Kerala):

- **Date:** August 7, 2020
- **Cause:** Unsafe descent and landing in tailwind conditions.
- **Contributing Factors:** Systemic failures and lax safety culture, poor training oversight by DGCA.
- **Impact:** 21 fatalities, including both pilots.
- **Aircraft:** Boeing 737-800

SAFETY STATISTICS

Global Flight Operations:

- Over 1 lakh flights operate daily, carrying approximately 12 million passengers worldwide.

MIT Study (2024)

- Shows risk reduced to 1 death per 13.7 million passengers (2018–2022), compared to 1 per 350,000 passengers in the previous decade.
- Average annual improvement of 7% in safety standards.

International Air Transport Association (IATA) Report (2024)

- Over 4.4 billion passengers flew safely in 2023 despite complex operational environments.

International Civil Aviation Organisation (ICAO) Safety Data (2023):

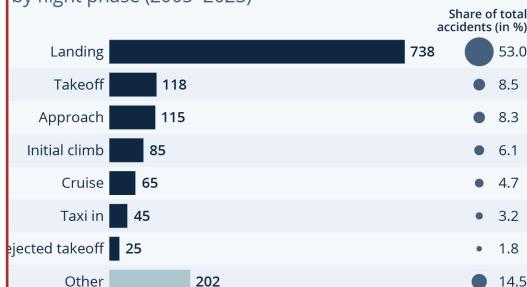
- Safest year in five years for global accident rate, fatal accidents, and fatalities.
- Accident rate: 1.87 accidents per million departures, a 17.9% decrease from 2.05 in 2022.
- Total accidents increased by 3.1% due to a 13% rise in global flight departures.

Time Magazine Study (2015):

- Back third of the aircraft: 32% fatality rate.
- Middle third: 39% fatality rate.
- Front third: 38% fatality rate.
- Best outcomes: Middle seats in the rear (28% fatality rate).
- Worst outcomes: Aisle seats in the middle third (44% fatality rate).

Most Airplane Accidents Happen During Landing

Number of accidents in commercial civil aviation, by flight phase (2005–2023)*

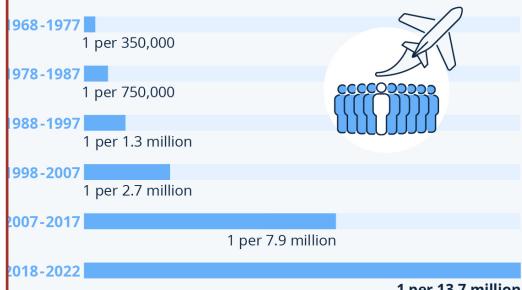


ATA members, accounting for 94 percent of all international flights. 2023 data up to end of June.

Source: IATA

Air Travel Keeps Getting Safer

Worldwide commercial air travel fatalities per passenger boarding*



Includes the period between arrival at the airport of origin to departure from the airport at destination.

Source: MIT



India's FAA IASA Category 1 Status

- Status:** The aviation safety regulator of the U.S, the Federal Aviation Administration (FAA) has confirmed that India retains its **"Category 1" status** for aviation safety oversight, meeting the standards set by the International Civil Aviation Organization (ICAO).
 - This status was last assessed in July 2018.
- IASA Program Assessment:** The FAA's International Aviation Safety Assessment (IASA) programme evaluates whether a country's aviation safety oversight meets ICAO standards.
 - It focuses on personnel licensing, aircraft operations, and airworthiness.
- Improved ICAO Audit Score:** As of November 2022, India's International Civil Aviation Organization (ICAO) audit score improved significantly to 85.65% from 69.95%, reflecting enhanced aviation safety and oversight.



CHALLENGES IN AVIATION SAFETY

● Indian Scenario:

- DGCA functions as an appendage of the Ministry of Civil Aviation, limiting its autonomy.
- Budget constraints and bureaucratic red tape hinder effective regulation.

● Inconsistent Reporting:

Delays in accident investigations hinder learning from past mistakes, leaving gaps in safety improvements.

- **Example:** According to IATA, only 48% of accidents since 2018 have had final investigation reports published.

● Infrastructure Limitations:

Runways and airport facilities often struggle to match the pace of growing aviation demands, increasing the risk of incidents.

- **Example:**
 - Non-compliance with international standards for runway signage and markings.
 - Narrow perimeter roads and flawed runway friction testing methods

● Environmental Threats:

Factors like bird strikes and unpredictable weather remain constant, unavoidable risks for airlines.

- Bird hits/ strikes, damages the engine, fuselage or wings.
- For example, a 6.8 kg goose hitting an aircraft

traveling at 200 knots can exert a force of over 16 tonnes.

● Human Factors:

- Pilot decisions under pressure and lapses in judgement highlight the human vulnerability in high-stakes situations.
- Instances of pilots switching between airlines and aircraft types without adequate retraining.

● Geopolitical Complexities:

Aviation incidents entangled in political disputes complicate accountability and resolution.

● Public Perception:

Despite improvements, accidents fuel distrust, with passengers questioning safety standards and airline commitments.

● Operational Strain:

The surge in flights and passengers challenges existing safety systems, testing their limits.

● Emergency Preparedness:

Not all airports and airlines are equally equipped to handle crises, leaving room for greater losses during incidents.

● Global Standardisation Issues:

Variations in adherence to international safety norms create disparities, undermining overall aviation safety.

● Technology vs. Oversight:

While automation reduces errors, over-reliance on technology without robust human oversight can lead to unforeseen failures.



GOVERNMENT INITIATIVES

● National Aviation Safety Plan (NASP) 2024-2028:

- Aligns with ICAO's Global Aviation Safety Plan and incorporates best practices based on international standards. Focuses on reducing operational safety risks
- Addressing eight **National High Risk Categories (N-HRCs)** including
 - Mid Air Collision, Controlled Flight into Terrain, Runway Excursions, Wildlife Strikes, Loss of Control in-flight, Runway Incursion, Ramp Safety, and Deficient Maintenance.

● Bomb Threat Management:

- The government plans to amend the Aircraft Security Rules and the **Suppression of Unlawful Acts against Safety of Civil Aviation (SUASCA) Act, 1982** to make punishments harsher for fake bomb threats and include culprits on the no-fly list.
- Security measures at airports have been increased, with **10% more security checks and enhanced CCTV coverage** to ensure no suspected articles are carried on board.

WAY FORWARD

- ✿ **Autonomy and Funding:** Grant DGCA financial and administrative independence to focus on safety and efficiency
- ✿ **Enhance Infrastructure:** Older airfields should be upgraded to meet modern safety standards, while expanding emergency response capabilities at critical airports to enhance overall aviation safety.
- ✿ **Bird strikes:**
 - **Hazard Assessment & Mitigation:**
 - Conduct thorough bird surveys.
 - Modify airport environment to deter birds (habitat modification).
 - Proactive bird control (scare tactics, population control).
 - **Operational Measures:**
 - Pilot awareness & training.
 - Adjust flight procedures to avoid high-risk areas.
 - Bird-resistant aircraft design.
- ✿ **Advanced Technology:** Utilize advanced technologies such as automation, predictive analytics, and real-time monitoring to enhance safety and prevent accidents.
- **Example: Enhanced Ground Proximity Warning System (EGPWS)** is a system designed to alert pilots if their aircraft is in immediate danger of flying into the ground or an obstacle.
- ✿ **Safety Culture:** Promote a proactive safety management system with regular audits, training, and integration of medical and training data while addressing training gaps for pilots and air traffic controllers.
- **Example:** The DGCA advised Indian airlines operating Boeing 737s to conduct safety risk assessments and provide recurrent training on handling potential rudder control issues, following concerns over faulty actuators.
- ✿ **Accountability:** To enhance air safety, it is crucial to establish clear accountability for lapses, penalise systemic negligence, and minimise political and commercial interference in regulatory decisions.
- **Example:** DGCA suspended Akasa Air's director of operations and director of training for six months due to lapses in pilot training and insufficient compliance with safety standards.
- ✿ **Fatigue Management:** Implement effective fatigue management programs to address the risks associated with crew fatigue, including flight time limitations, rest requirements, and fatigue monitoring tools.
- ✿ **Emergency Response Planning:** Develop comprehensive emergency response plans to effectively manage and mitigate the consequences of accidents or incidents.

CONCLUSION

While aviation incidents highlight inherent risks, statistical data demonstrates substantial improvements in global safety standards. Continuous focus on modernisation, global cooperation, and transparent investigations is critical to maintaining passenger trust and enhancing safety further.

SAMPLE QUESTION

Q) The growth of the aviation sector has been accompanied by concerns over safety and security. Discuss the measures taken by the government to ensure aviation safety and their effectiveness **(10marks)(150 words)**

SPADEX (SPACE DOCKING EXPERIMENT)

Syllabus: GS III - Science and Technology

PYQ MAPPING

Q1 Launched on 25th December, 2021, James Webb Space Telescope has been much in the news since then. What are its unique features which make it superior to its predecessor Space Telescopes? What are the key goals of this mission? What potential benefits does it hold for the human race? **(2022)**

Q2 Discuss India's achievements in the field of Space Science and Technology. How the application of this technology has helped India in its socio-economic development? **(2016)**

Q3 India has achieved remarkable successes in unmanned space missions including the Chandrayaan and Mars Orbiter Mission, but has not ventured into manned space mission, both in terms of technology and logistics? Explain critically. **(2017)**

WHY IN NEWS

ISRO has launched the two satellites (SDX01 (Chaser) and SDX02 (Target)) as part of the mission on December 30 with the help of PSLV C60 rocket from Satish Dhawan Space Centre in Sriharikota. It will make India the **fourth country after USA, Russia and China in the world to achieve the feat.**

INTRODUCTION

- The SpaDeX (Space Docking Experiment) mission is a pioneering cost-effective technology demonstrator launched by India's PSLV (Polar Satellite Launch Vehicle) to develop and test in-space docking technology.
- The indigenous technology used for this mission is called the **"Bharatiya Docking System".**
- This mission positions India to potentially become the fourth nation to achieve this capability, vital for ambitious space endeavors like lunar sample returns, the **Bharatiya Antariksh Station (BAS)**, and long-duration human space missions.

SHORT TAKES

➤ Spacecraft docking:

- It refers to the process where two spacecraft connect in space. It's usually a procedure in which a spacecraft (such as a space station module or a spaceship) joins with another spacecraft or space station.
- For example, the International Space Station (ISS) receives cargo and crew through docking from spacecraft like SpaceX's Dragon or Russian Soyuz. This process requires precise alignment and control to ensure the safety and stability of both spacecraft.

➤ Rendezvous and docking

- Rendezvous is the process of bringing two spacecraft together, whereas docking is their subsequent meeting and physical joining.

- The essential elements of a rendezvous are the matching of orbital trajectories and the movement of one spacecraft within close proximity of the other, typically within 100 metres (330 feet). Ideally, the two spacecraft also should lie in the same orbital plane.

➤ Global Navigation Satellite System (GNSS)

- It refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers. The receivers then use this data to determine location.
- Examples of GNSS include Europe's Galileo, the USA's NAVSTAR Global Positioning System (GPS), Russia's GLONASS and China's BeiDou Navigation Satellite System and India's IRNSS – NAVIC.

OBJECTIVES

➤ Primary Objective

- Demonstrate the technology required for **rendezvous, docking, and undocking** of two small spacecraft (SDX01, Chaser, and SDX02, Target) in a low Earth orbit (LEO).

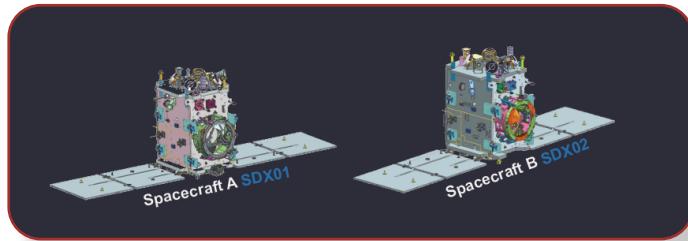
➤ Secondary Objectives

- Demonstration of **electric power transfer** between the docked spacecraft for in-space applications such as robotics.
- Development of **composite spacecraft control** strategies.
- Execution of **payload operations post-undocking**, enabling extended mission utility.

MISSION CONCEPT

Launch Details:

SpaDeX involves two small spacecraft (**SDX01, Chaser, and SDX02, Target each ~220 kg**), launched together into a 470 km circular orbit at 55° inclination by PSLV-C60.



Separation and Rendezvous:

- Upon separation, the Target and Chaser will achieve a **10-20 km separation** using minor propulsion adjustments.
- The Target's propulsion system will neutralize relative velocity to align orbits (Far Rendezvous).
- The Chaser will then approach the Target in stages, reducing inter-satellite distances progressively (e.g., 5 km, 500 m, 3 m) until docking.

Docking Process:

- The docking will involve a **low-impact mechanism** with a relative velocity of ~10 mm/s.
- After docking, the spacecraft will transfer power, demonstrate other technologies, and later undock for independent payload operations.

✓ **PSLV-C60 Vehicle Configuration (S139+PL40+HPS3+L1.6 (Ti))**

	Stage 1 (PS1)	Stage 2 (PS2)	Stage 3 (HPS3)	Stage 4 (PS4)
Length (m)	20	12.8	3.6	3.0
Diameter (m)	2.8	2.8	2	1.34
Propellant	Solid (HTPB based)	Liquid (UH25 + N ₂ O ₄)	Solid (HTPB based)	Liquid (MMH + MON3)
Propellant Mass (t)	138	42	7.65	1.6

✓ **Satellites in PSLV-C60**

Satellites	Agency	Spacecraft Mass
SPADEX-A	ISRO	~ 220 kg
SPADEX-B	ISRO	~ 220 kg

Payload Accommodation in PSLV-C60

KEY TECHNOLOGIES USED

The indigenous technologies developed for enabling this docking mission are as follows:

- » Docking mechanism,
- » A suite of four rendezvous and docking sensors,
- » Power transfer technology,
- » Indigenous novel autonomous rendezvous and docking strategy,
- » Inter-satellite communication link (ISL) for autonomous communication between spacecraft, incorporated with inbuilt intelligence to know the states of the other spacecraft,
- » GNSS-based Novel Relative Orbit Determination and Propagation (RODP) processor to determine the relative position and velocity of the other spacecraft,
- » Simulation test beds for both hardware and software design validation and testing.

In addition, SpaDeX, because of its small size and mass, is even more challenging due to the finer precision required for the rendezvous and docking maneuvers compared to docking two large spacecraft. This mission will be a forerunner for autonomous docking needed for future lunar missions like Chandrayaan-4 without the support of GNSS from Earth.

DOCKING MECHANISM

- The SpaDeX docking mechanism is a **low-impact**

system designed for precise, safe docking between spacecraft, operating at a slow approach velocity (~10 mm/s).

- Its **androgynous design** allows identical docking systems on both spacecraft, enabling flexibility. Inspired by the **International Docking System Standard (IDSS)**, it uses a **compact peripheral mechanism** (450 mm diameter) with **two motors** and one degree of freedom, making it simpler and lighter than IDSS (800 mm, 24 motors).
- Extensive **hardware and software tests** validated its kinematics and parameters, ensuring reliable performance in orbit, making it ideal for small spacecraft and future autonomous docking missions.

SENSOR SUITE

- Laser Range Finder (LRF):** Measures range (6000–200 m) and determines relative position and velocity.
- Rendezvous Sensors (RS):** Operate in ranges of 2000–250 m and 250–10 m, providing 3D relative position (x, y, z).
- Proximity and Docking Sensor (PDS):** Tracks position and velocity within 30–0.4 m range.
- Laser Diodes (LDs):** Serve as targets for RS and PDS.

- **Video Monitor:** Captures the docking event within 20–0.5 m.
- **Mechanism Entry Sensor (MES):** Detects Chaser entry into the Target at close ranges (8–4 cm).

❖ **ISL-enabled GNSS-based RODP**

- **Differential GNSS:** Both spacecraft use GNSS-based Satellite Positioning Systems (SPS) for Position, Navigation, and Timing (PNT).

- **RODP (Relative Orbit Determination and Propagation) Processor:** A specialized processor calculates relative states by comparing GNSS carrier phase measurements from both spacecraft.
- **Inter-Satellite Link (ISL):** VHF/UHF (Very High Frequency - Ultra High Frequency transceiver) transceivers enable data sharing of GNSS measurements between the Chaser and Target.

POST DOCKING ACTIVITIES

♣ **Payload Operations:**

- SDX01: **High-Resolution Camera (HRC)** for surveillance and imaging.
- SDX02: **Miniature Multi-Spectral Payload (MMX)** for vegetation studies and natural resource monitoring.

- **Radiation Monitor (RadMon):** Collects radiation data for space science and human spaceflight applications.

♣ **Separation:**

After completing the docking demonstration, the spacecraft will undock and continue their independent payload missions.

DEVELOPMENT AND INTEGRATION

☀ The SpaDeX spacecraft were developed by ISRO's UR Rao Satellite Centre (URSC) with support from other ISRO centers. Integration and testing were supervised at Ananth Technologies, Bangalore.

☀ Post-testing, the spacecraft moved to SDSC for launch preparations, leveraging ISRO's ground control facilities.

SIGNIFICANCE

- Enables **multi-launch missions** for space stations, lunar exploration, and interplanetary projects.
- Fosters autonomy in **space robotics and in-orbit servicing.**

- Sets the stage for advanced missions like **Chandrayaan-4** and beyond, demonstrating India's technological edge in precision orbital maneuvers and space infrastructure.

SPACE FARMING: Cowpeas seed germinated in space

- » In a significant achievement, ISRO's first biological experiment in space, which involved sending cowpea (*Vigna unguiculata*) seedlings to space, has seen success as the seedlings sprouted their first leaves.
- » The experiment, part of the **CROPS (Compact Research Module for Orbital Plant Studies)**, was conducted aboard ISRO's POEM-4 module.
- » Developed by the Vikram Sarabhai Space Centre, this experiment aimed to grow plants in a microgravity environment using an automated platform with thermal management.
- » Out of the eight seeds, at least three sprouted, marking an important milestone in space research, with potential applications for long-duration space missions.

CONCLUSION

The SpaDeX mission exemplifies India's forward leap in space technology, enhancing self-reliance and broadening possibilities for future human and robotic exploration.

SAMPLE QUESTION

Q) Describe the role of indigenous innovations in the SpaDeX mission, including its docking mechanism and sensor suite. How do these advancements position India in the global space domain? **(10 marks) (150 words)**

GROUNDWATER CONTAMINATION

Syllabus: GS III - Environmental Pollution

PYQ MAPPING

Q Enumerate the National Water Policy of India. Taking river Ganges as an example, discuss the strategies which may be adopted for river water pollution control and management. What are the legal provisions for management and handling of hazardous wastes in India? (2013)

Q What are the salient features of the Jal Shakti Abhiyan launched by the Government of India for water conservation and water security? (2020)

SHORT TAKES

➤ **Central Ground Water Board (CGWB):** Established in 1970, is a national agency under the Ministry of Water Resources, responsible for the management, exploration, monitoring, and regulation of groundwater resources in India. It was formed by renaming the Exploratory Tube Wells Organization and later merged with the Ground Water Wing of the Geological Survey of India in 1972.

INTRODUCTION

Groundwater contamination in India reflects a deeper nexus of unsustainable agricultural practices, industrial negligence, and inadequate resource management. The rising levels of nitrates, fluoride, and uranium highlight the urgent need for a holistic approach to balance development with environmental sustainability.

WHY IN NEWS

The recent **Central Ground Water Board (CGWB)** report warns of escalating groundwater contamination across India, with excessive nitrate levels in many districts. It poses significant health risks, particularly for children.

FINDINGS OF THE CGWB REPORT

Groundwater Extraction:

- o **60.4%** of India's groundwater is being extracted, consistent since 2009.
- o **73%** of groundwater blocks are in the '**safe zone**', meaning replenishment compensates for extraction.
 - This is an improvement from **67.4%** in 2022.
- o **343 fewer blocks** were analysed for the 2024 assessment compared to 2022.

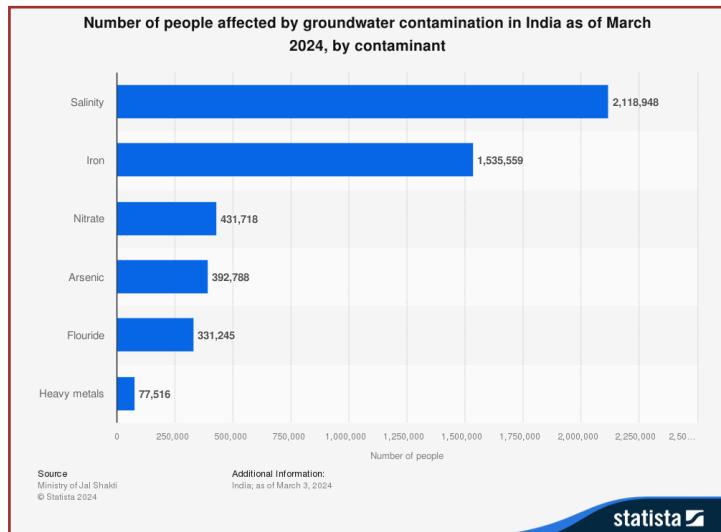
Rising Nitrate Contamination (defined as more than 45 mg per litre):

- o As of 2023, **440 districts** in India have excessive nitrates in groundwater, up from 359 in 2017, affecting 56% of districts.
- o **19.8% of 15,239 groundwater samples** had excessive nitrate, similar to 21.6% of 13028 samples in 2017.
- o **Affected States:**

- Rajasthan(49%), Karnataka(48%), and Tamil Nadu(37%) are most affected.
- Maharashtra (35.74%), Telangana (27.48%), Andhra Pradesh (23.5%), and Madhya Pradesh (22.58%) show increasing nitrate levels.
- o **Impact of Monsoon:** Nitrate contamination increases slightly after the monsoon, with 32.66% of post-monsoon samples affected compared to

30.77% pre-monsoon.

- o **Causes:** Geological factors in some regions and use of nitrogenous synthetic fertilizers contribute to high nitrate levels.
- o **After effects:**



- Excessive nitrate causes **methemoglobinemia** and '**Blue Baby Syndrome**' in infants, and leads to harmful algal blooms in aquatic ecosystems.
- Hypertension, cyanosis, infant mortality, stomach cancer, goitre, thyroid disorders, headaches, cytogenetic defects, and congenital malformations.

→ Other Contaminants:

- **Fluoride Contamination:** High fluoride levels above the permissible limit are a major concern in Rajasthan, Haryana, Karnataka, Andhra Pradesh, and Telangana.
- **Uranium Contamination (over 30 ppb):** Rajasthan and Punjab report the highest uranium concentrations exceeding 100 ppb, with regions like Gujarat, Haryana, and Tamil Nadu also affected

by unsafe levels.

→ Groundwater Monitoring

- CGWB uses 26,000 observation wells, with 16,000-17,000 digital water level recorders connected to piezometers since 2023.
- Plan to expand to 40,000 wells by 2026, contributing to a total of 67,000 digitally monitored units nationwide.

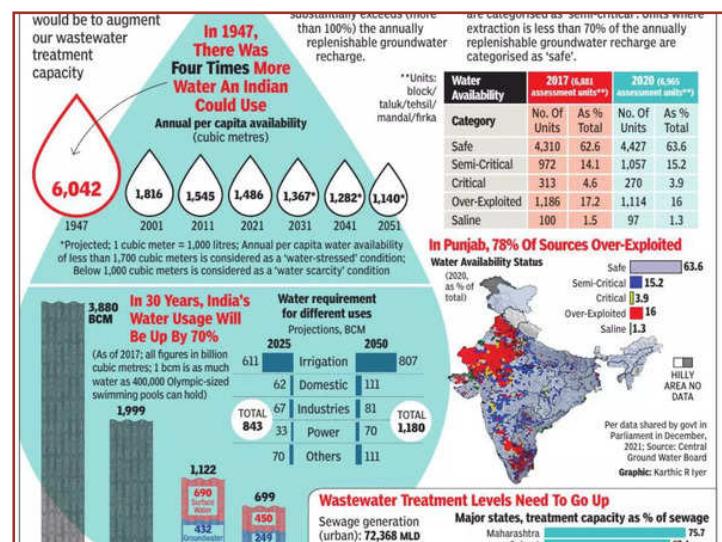
IMPORTANT DATA

☛ Study published in *Chemosphere* by researchers from Centre for Water Resources Development and Management (CWRDM), Kufos, and University of Kerala

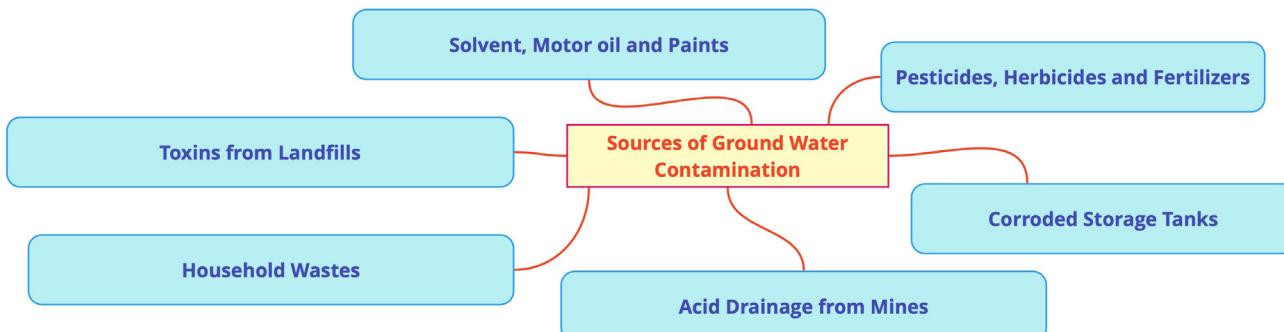
- **Sample Size:** 344 well samples analyzed across Kerala.
- **Timeframe:** Comparison of groundwater data from 2010 and 2018.
- **Findings:** Northern Thiruvananthapuram, coastal zones of Thrissur, Malappuram, Kozhikode, and eastern Idukki districts showed nitrate concentrations exceeding 45 mg/l (BIS limit).

☛ Study published in *Science of the Total Environment* by researchers from IIT Mandi and IIT Jammu.

- **Focus:** Groundwater contamination in Himachal Pradesh's Baddi-Barotiwala (BB) industrial area.



- **Findings:** Presence of geogenic uranium, a naturally occurring radioactive element, in the groundwater. Elevated levels of toxic metals (zinc, lead, cobalt, nickel, chromium) from industrial activity.



GOVERNMENT INITIATIVES FOR GROUNDWATER MANAGEMENT

☛ Jal Shakti Abhiyan (JSA):

- Initiated in 2019 in water-stressed blocks of 256 districts, it focuses on water conservation, rainwater harvesting, and creating artificial recharge structures in water-stressed districts.
- Extended in 2021 and 2022 across rural and urban areas.
- Utilizes funds from MGNREGA and PMKSY-Watershed development.

☛ Amrit Sarovar Mission:

- Initiated on April 24, 2022, to rejuvenate 75 water bodies in each district as part of Azadi ka Amrit Mahotsav.
- Aimed at the development and rejuvenation of water bodies across the country.

☛ Atal Bhujal Yojana (Atal Jal):

- A ₹6,000 crore central sector scheme which covers 80 districts, 229 administrative blocks, and 8,220

water-stressed Gram Panchayats in seven states from April 2020.

- o Focuses on sustainable groundwater management through community participation.
- o Preparation of water security plans, groundwater data sharing, capacity building, and a combination of demand-side and supply-side management.

GLOBAL BEST PRACTICES

- ✿ **Los Osos Wastewater Project (California, USA):** A \$180 million plant that treats wastewater, recycling 100% through irrigation and groundwater percolation.
- ✿ **Groundwater Supply (Manila, Philippines):** Addressed depletion of deep well groundwater by augmenting supply with surface water reservoirs, delivering 150 million liters of water per day.

National Aquifer Mapping and Management Programme (NAQUIM):

- o Aimed at delineating and characterizing aquifers and developing groundwater management plans in the entire mappable area of India (around 25 lakh sq km).

- ✿ **Khatan Group of Villages Water Supply Scheme (India):** A scheme by Larsen & Toubro providing clean water to 14 million people across 388 villages, saving time spent by women fetching water.

- ✿ **Tongzhou Water Works (Beijing, China):** Reduced reliance on groundwater by over 50% through the South-to-North Water Diversion Project, cutting design review time and construction costs.

WAY FORWARD

- ✿ **Promote Water-Efficient Practices:** Encourage the adoption of less water-intensive crops like millets and efficient irrigation techniques to reduce groundwater usage.
- ✿ **Monitoring and Regulation:** Enhanced monitoring of groundwater quality and stricter enforcement of standards to prevent over-extraction and contamination.
- ✿ **Awareness Campaigns:** Educating the public, especially in high-risk areas, about the dangers of nitrate contamination and the importance of groundwater conservation.
- ✿ **Aquifer Recharge Initiatives:** Expanding artificial recharge projects and encouraging natural recharge through watershed management and rainwater harvesting.
- ✿ **Policy Integration:** Integrating groundwater management with broader water resource policies and urban planning to ensure sustainable water use.
- ✿ **Technological Advancements:** Leveraging technology for real-time groundwater monitoring, data collection, and predictive modelling to manage resources efficiently.
- ✿ **Incentives for Water Conservation:** Offering financial incentives or subsidies for water-saving technologies and practices, particularly in agriculture.
- ✿ **Regulate Industrial Discharge:** Strengthening regulations on industrial waste disposal to prevent toxic contamination of groundwater, especially in industrial zones.

CONCLUSION

Addressing groundwater contamination requires more than reactive measures; it demands systemic changes in policy, agricultural practices, and community participation. Only through proactive interventions and sustainable water management can India ensure the health and resilience of its population and ecosystems.

SAMPLE QUESTION

Q) Groundwater contamination in India is a consequence of unsustainable agricultural practices and urbanisation. Analyse the statement with suitable examples. **(10marks)(150 words)**

INDIA BANGLADESH EXTRADITION TREATY

Syllabus: GS II - India & its neighbourhood

PYQ MAPPING

Q1 The protests in Shahbag Square in Dhaka in Bangladesh reveal a fundamental split in society between the nationalists and Islamic forces. What is its significance for India? (2013)

Q2 India is an age-old friend of Sri Lanka.' Discuss India's role in the recent crisis in Sri Lanka in light of the preceding statement. (2022)

Q3 "Increasing cross-border terrorist attacks in India and growing interference in the internal affairs of several member-states by Pakistan are not conducive for the future of SAARC (South Asian Association for Regional Cooperation)." Explain with suitable examples (2016)



INTRODUCTION

- Bangladesh's interim government, led by Muhammad Yunus, has formally requested India's extradition of Sheikh Hasina to face charges, including corruption and crimes against humanity.
- This request was conveyed through a "note verbale" (a diplomatic communication), but it appears to serve more as a gesture to address domestic political pressures in Bangladesh rather than a genuine escalation in bilateral relations.

WHY IN NEWS

The interim government of Bangladesh, headed by Nobel laureate Muhammad Yunus, has recently submitted a formal request to India seeking the extradition of Sheikh Hasina to face allegations of conspiracy, genocide, and crimes against humanity.

SHORT TAKES

➤ Note Verbale

- o It is a formal, diplomatic communication used in international relations, often in the context of treaties or agreements
- A Note Verbale is an unsigned written communication prepared on the official letterhead of the sending entity (such as a

foreign ministry or diplomatic mission).

- It is stamped with the official seal but is not signed, making it less formal than a signed diplomatic note.
- Written in the **third person**, it avoids the personal tone of direct communication.

INDIA'S POSITION

- Indian Foreign Secretary Vikram Misri visited Dhaka in December, signaling India's commitment to maintaining strong ties with Bangladesh, emphasizing trade, energy, infrastructure, and connectivity.
- While India has not outrightly rejected the extradition request, it has taken a cautious, non-escalatory approach, aiming to balance the issue without straining diplomatic ties.

➤ Historical Bonds:

- o India's relationship with Sheikh Hasina is deeply rooted in historical sacrifices made during Bangladesh's liberation struggle in 1971.
- o Sheikh Hasina's father, Sheikh Mujibur Rahman (Bangladesh's founding leader), was assassinated in 1975, after which she sought refuge in India. These events have strengthened the bond between her family and India.

EXTRADITION

It is the official mechanism through which a country seeks the transfer of an individual accused or convicted of a crime from another country. This process ensures that criminals cannot evade justice by crossing international borders. India, backed by a comprehensive network of extradition treaties and agreements, actively contributes to global law enforcement efforts.

EXTRADITION TREATY BETWEEN INDIA AND BANGLADESH

- It was established to tackle the issue of Indian insurgents, especially from the Northeast, seeking shelter in Bangladesh, and Bangladeshi militants finding refuge in India.
- Initially signed in 2013, the treaty was amended in 2016 to simplify and expedite the process of extraditing fugitives.

→ Features

» **Eligible Individuals for Extradition:**

Persons accused, convicted, or wanted for committing a qualifying offence in the requesting country can be extradited.

» **Definition of Extraditable Offences:**

Crimes punishable by a minimum of one year of imprisonment, including financial offences, fall

under the scope of extradition.

» **Dual Criminality Requirement:**

The act in question must be considered a criminal offence in both India and Bangladesh for extradition to proceed.

» **Expanded Coverage of Offences:**

The treaty also applies to attempts, assistance, incitement, or acting as an accomplice in committing an extraditable offence.

» 2016 Amendment:

- The amendment removed the requirement to provide evidence of the alleged crime. Instead, an arrest warrant issued by a competent court in the requesting country is sufficient for initiating extradition.

Significance of Extradition Treaties

◆ **Facilitating Legal Cooperation:**

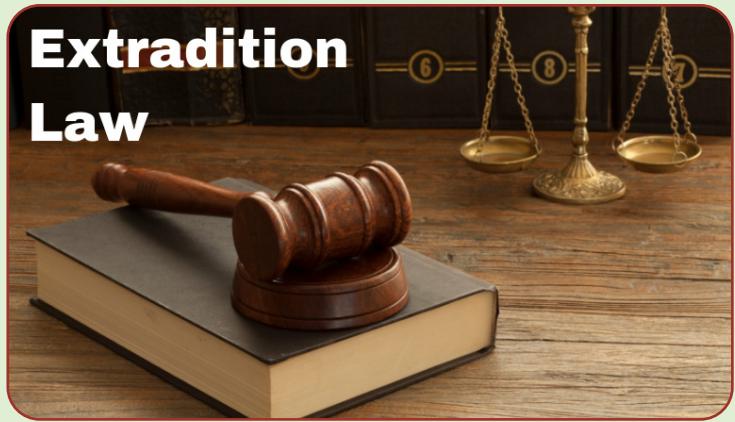
- o Extradition treaties play a vital role in ensuring that individuals accused or convicted of crimes cannot evade justice by fleeing to another country. This strengthens the global rule of law.
- o For example, India has established extradition treaties with several nations, including the United States (1997), the United Kingdom (1992), Canada, and Bangladesh (2013, updated in 2016), enabling the legal transfer of fugitives involved in serious offenses.

◆ Strengthening Diplomatic Relations:

- Such treaties signify mutual trust and a shared commitment to addressing cross-border criminal activities.
- India's extradition treaty with Thailand (2013) is a case in point, aiding in the apprehension of fugitives and fostering security cooperation. These agreements often pave the way for further collaboration in areas like defense, trade, and cultural exchange, thereby deepening bilateral ties.

◆ Addressing Transnational Crimes:

- Extradition agreements are indispensable in the fight against transnational threats, including terrorism, drug trafficking, insurgency, and money laundering. They ensure that nations can work together to tackle crimes that extend beyond their borders.



CHALLENGES IN THE EXTRADITION OF SHEIKH HASINA

▼ Diplomatic and Political Sensitivities:

- Extradition of a former Prime Minister, particularly one with a strong historical and political connection to India, risks straining bilateral relations.
- The issue is further complicated by accusations of political vengeance behind the charges.

▼ Absence of an elected government in Bangladesh

- Raises concerns about the lack of accountability in governance, which could undermine the fairness and adherence to the rule of law in any trial involving Sheikh Hasina.

▼ Legal Complexities:

- India's Extradition Act of 1962 includes the "political offence" exception, which can be invoked to deny extradition requests if charges are deemed politically motivated.

- Common law jurisdictions emphasize the rule of non-inquiry, giving the executive discretion in extradition matters, though judicial intervention may challenge this discretion.

▼ Human Rights Concerns:

- Bangladesh's record on prison conditions and alleged instances of torture creates a credible risk of human rights violations for Sheikh Hasina if extradited.

▼ International Scrutiny:

- India's decision will attract global attention, particularly from human rights organizations, potentially affecting its international reputation.

▼ Risk of Precedent:

- Extraditing a political leader could set a precedent, impacting India's ability to grant asylum in future cases of persecution.

WAY FORWARD

✳ Ensuring a Fair Trial Mechanism:

- India could propose an arrangement allowing Sheikh Hasina to participate in her trial via video conferencing, ensuring her legal rights are respected while addressing Bangladesh's demand for justice.
- Alternatively, India could push for assurances from Bangladesh that her trial will be impartial, transparent, and meet international judicial standards.

in India, depending on a bilateral agreement, to avoid potential risks to her safety in Bangladesh.

✳ International Mediation or ICC Involvement:

- If concerns about judicial impartiality persist, the case could be referred to the International Criminal Court (ICC) to ensure an unbiased trial.

✳ Maintaining Bilateral Relations:

- Diplomatic communication must emphasize the importance of not letting this issue dominate or derail broader India-Bangladesh cooperation.

✳ Public Communication Strategy:

- Both nations must engage in transparent public communication to avoid perceptions of bias or coercion, focusing on the legal and humanitarian aspects of the matter.

CONCLUSION

India cannot be pressured into unfavorable terms by Bangladesh, especially when Bangladesh itself is in a fragile state. Stability must take precedence over assigning culpability, as it is essential for constructive engagement. Diplomatic solutions remain the most viable approach, and India must strive to ensure that negotiations result in outcomes that are mutually beneficial, fostering regional harmony and strengthening bilateral ties.

SAMPLE QUESTION

Q) Analyze the implications of Bangladesh's request for Sheikh Hasina's extradition, conveyed through a note verbale, on India-Bangladesh relations. How does this reflect the role of diplomatic communication in managing domestic political pressures?
(10 marks) (150 words)

WEEKLY DOSSIERS

THREATS TO FRESHWATER SPECIES AND THE RISK OF EXTINCTION

Freshwater habitats, including rivers, lakes, ponds, and wetlands, although covering less than 1% of the planet's surface, support approximately 10% of its animal species. A new study, published in the journal *Nature* in January 2025, reveals that nearly a quarter of the species that inhabit these fragile ecosystems are at risk of extinction.

The research examined around 23,500 species of freshwater animals, including fish, crabs, and dragonflies, and found that 24% of them are classified as vulnerable, endangered, or critically endangered.

KEY FINDINGS

- ◆ **Vulnerability of Freshwater Species:** Freshwater ecosystems face numerous threats, including pollution, dams, water extraction, agriculture, invasive species, and climate change, leading to a rapid decline in biodiversity.
- ◆ **Human Activities:** Deforestation, illegal mining, and unregulated gold mining exacerbate these threats. In the Amazon, illegal miners dump mercury, and forest fires pollute rivers with ash.
- ◆ **Disruptions to Ecosystems:** Rivers and wetlands concentrate environmental impacts, meaning disruptions like oil spills or acid discharges can devastate entire species.
- ◆ **Global Perspective:** Freshwater species worldwide are threatened, with river modifications through damming in North America and Europe further endangering biodiversity.

IMPLICATIONS

- ◆ **Biodiversity Loss:** The research highlights the growing concern over the loss of freshwater biodiversity, which is crucial for the overall health of ecosystems and human livelihoods. Freshwater species contribute to the balance of the ecosystems they inhabit and serve vital roles such as water purification, nutrient cycling, and supporting food webs.
- ◆ **Ecological Impact:** The degradation of freshwater habitats not only threatens species survival but also affects local communities that rely on these water

sources for drinking, agriculture, and fishing. The disruption of ecosystem services could lead to a broader ecological crisis.

- ◆ **Urgency of Conservation Measures:** The study calls for urgent action to protect freshwater species. This includes stronger regulations on water usage, pollution control, and sustainable practices in agriculture and mining. Additionally, it stresses the importance of addressing climate change and habitat conservation to prevent further degradation.

CONCLUSION

The new research underscores the critical need for a global strategy to protect freshwater ecosystems and the species that depend on them. The interconnectedness of environmental threats, from pollution to illegal activities, requires coordinated efforts from governments, conservationists, and communities to safeguard these vital habitats.

THE ACCELERATING IMPACT OF CLIMATE CHANGE IN 2024

According to the latest climate research, the world may have already surpassed the critical threshold of 1.5°C of warming above pre-industrial levels, a point that scientists warn could trigger irreversible and extreme climate events.



KEY FINDINGS

◆ Global Temperature and Warming Threshold:

- Recent studies, particularly one published in *Nature Geoscience*, indicate that the world may have reached 1.49°C of warming as early as 2023. This is based on data from Antarctic ice cores dating back to 13 AD, challenging the traditional baseline of 1850-1900.
- The crossing of the 1.5°C threshold increases the risk of extreme climate events, including more frequent and intense heatwaves, floods, and wildfires.

◆ Ocean and Atmospheric Changes:

- The Atlantic Meridional Overturning Circulation (AMOC), a key ocean current system that influences weather patterns across the Atlantic, has weakened by 15% since 1950. New research suggests that this could soon reach a critical slowdown, affecting Europe's climate.
- Ocean warming is linked to stronger and more rapidly intensifying storms.
 - For example, Hurricane Milton in October 2024 escalated from a tropical storm to a Category 3 hurricane in just one day, causing severe flooding in Florida.

CONCLUSION

The research underscores the interconnectedness of climate systems and the cascading effects of climate change across various ecosystems. Addressing these threats requires coordinated international efforts to reduce emissions, protect critical habitats, and strengthen climate resilience globally.

TRANSFORMING INDIAN AGRICULTURE THROUGH DRONES

Drones are revolutionizing Indian agriculture by addressing challenges like labor shortages, inefficiency in pesticide spraying, and high fertilizer costs.

MARKET GROWTH

The Indian agricultural drone market is expected to grow from \$145.4 million in 2024 to \$631.4 million by 2030, with a CAGR of 28.1%.

KEY DRIVERS

- Labor Shortage:** Drones automate labor-intensive tasks like spraying and fertilizing, reducing the need for human labor.

flooding in Florida.

◆ Wildfires and Forests:

- Global warming has led to drier forests and waterways, increasing the frequency and intensity of wildfires. Notably, the Amazon rainforest faced its worst drought in 2024, coupled with widespread fires.
- A 2024 study revealed that forests failed to absorb as much CO2 as before, largely due to the Amazon drought and wildfires in Canada, resulting in record levels of carbon emissions.

◆ Arctic Tundra and Volcanic Activity:

- Rising wildfire emissions in the Arctic tundra are leading to the release of more carbon than the region can absorb. Traditionally a carbon sink, the tundra has become a net carbon emitter due to the impacts of climate change.
- In Iceland, rapid glacier retreat has been linked to increased volcanic activity. With less pressure from glaciers, magma reservoirs are destabilizing, potentially leading to more volcanic eruptions, which could further disrupt ecosystems and release greenhouse gases.



- Cost-Effectiveness:** Drones offer precise and efficient methods for applying pesticides and fertilizers, lowering operational costs.

- ◆ **Government Support:** Subsidies, loans, and training programs are accelerating drone adoption.
- ◆ **Awareness:** Growing awareness among farmers about drone benefits is driving demand.

REGIONAL ADOPTION

States like Maharashtra, Tamil Nadu, and Uttar Pradesh are leading in drone adoption due to fertile lands, progressive farming communities, and supportive policies.

CHALLENGES AND OPPORTUNITIES

While drones are expected to reach 80% adoption in 5-7 years, challenges include high costs and infrastructure needs. However, the market's growth offers opportunities for manufacturers and service providers.

CONCLUSION

Drones are transforming agriculture in India by improving efficiency, sustainability, and profitability. With government support and increasing awareness, drones are set to become essential tools for Indian farmers, offering immense growth potential.

KURUKSHETRA - NOVEMBER 2024

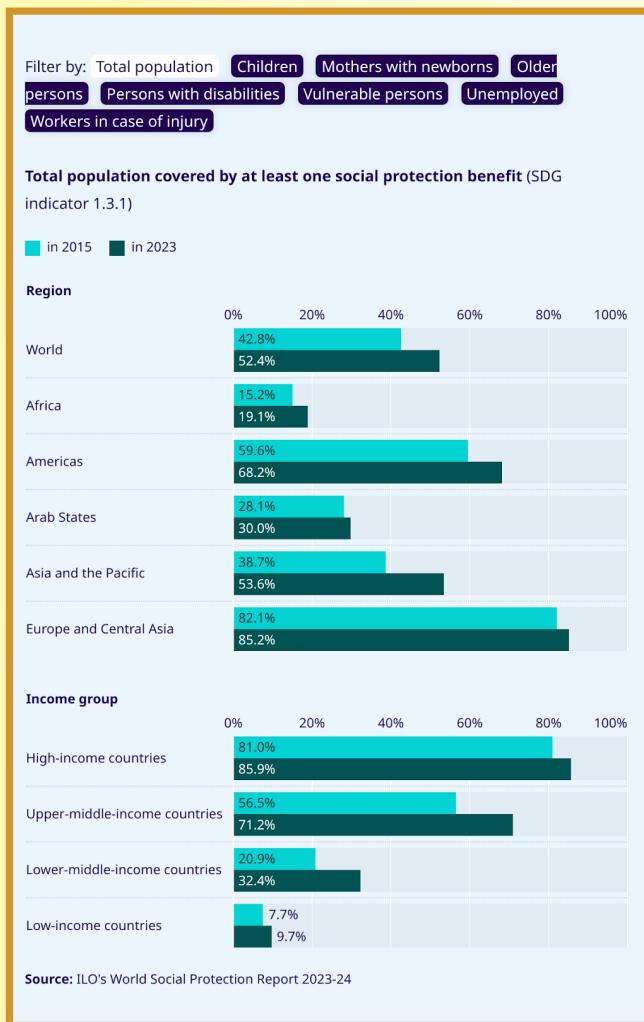
Social Security and Welfare

SOCIAL SECURITY VITAL FOR DEVELOPMENT AND PROSPERITY

◆ **Definition of Social Protection by International Labour Organisation (ILO):** A set of policies and programmes designed to reduce and prevent poverty, vulnerability and social exclusion throughout the life cycle.

◆ **World social protection report 2024- 26 by ILO:**

- Low- and middle-income countries need an additional \$1.4 trillion annually (3.3% of GDP) to ensure basic social security.



◆ **Social Security Programs in India**

- Right to Education (RTE) Act, 2009:** Provides free and compulsory education for children aged 6–14 years.
- Sarva Shiksha Abhiyan (SSA):** Targets free and compulsory education for 192 million children in

1.1 million habitations.

◆ **Samagra Shiksha Scheme**

- Integrated scheme covering pre-school to Class XII.
- Supports RTE implementation and aligns with NEP 2020 recommendations.
- Covers 1.16 million schools, 156 million students, and 5.7 million teachers.

◆ **Mukhyamantri Kanya Utthan Yojana (Bihar)**

- Covers 16 million girls and young women aged 0–21 years.
- Aims to combat systemic discrimination and gender inequality.

◆ **Mid-Day Meal Scheme (PM Poshan)**

- Launched in 1995 and renamed PM Poshan.
- Provides free lunch to children in government and government-aided pre-primary, primary, and upper-primary schools.
- Covers 11.8 crore students in 11.2 lakh schools.
- World's largest school meal programme, boosting enrolment, reducing dropouts, and improving nutrition.

◆ **Food Security Initiatives**

◆ **Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY)**

- Provides free food grains (5 kg per beneficiary) to 800 million beneficiaries.
- Extended for five years from January 2024.

◆ **Creating a Coordinated and Responsive Indian Social Protection System (CCRISP):**

- World Bank-funded (\$1.15 billion) to strengthen India's social protection response during crises like COVID-19.
- Supports schemes under Pradhan Mantri Garib Kalyan Yojana (PMGKY).

◆ **National Food Security Act (NFS), 2013**

- Covers 81.35 crore beneficiaries (75% rural,

- **Definition:** As per the Unorganised Workers' Social Security Act, 2008, an unorganised worker is:
 - A home-based worker, self-employed worker, or wage worker in the unorganised sector.
 - Includes workers in the organised sector not covered under Acts listed in Schedule II.
- **Workforce Composition:**
 - Total workforce: **565 million** (2023-24).
 - **45% in agriculture, 28.9% in services, 13% in construction, and 11.4% in manufacturing.**

- **Key Social Security Mechanisms**
 - **eShram Portal:** Over 29.85 crore unorganised workers registered (as of July 2024).
 - **Employees' State Insurance (ESI):** Covers 132 million beneficiaries, offering health protection, unemployment insurance, and sickness benefits.
 - **Employees' Provident Fund Organisation (EPFO):** Provides income protection for formal sector workers, covering 252 million beneficiaries

SOCIAL SECURITY AND WELFARE FOR FARMERS FOR BUILDING VIKSIT BHARAT

- ◆ **Economic Survey 2023-24:** Agriculture employs 55% of the population but contributes only 18% to GDP.
- ◆ **Pradhan Mantri Kisan Samman Nidhi (PM-KISAN):**
 - Launched: 24 February 2019.
 - Annual financial aid: ₹6,000 in three instalments via DBT to small and marginal farmers.
 - Covers approximately 11 crore farmers (as of 2024).
- ◆ **Kisan Credit Card (KCC):**
 - Introduced in 1998 under the Ministry of Agriculture and Farmers Welfare of India
 - Provides loans up to ₹3 lakh at subsidised interest rates.
 - ₹2 lakh crore credit allocated to 2.5 crore farmers, including fishermen and animal husbandry workers.
- ◆ **e-NAM (National Agriculture Market):**
 - Digital platform connecting farmers to agricultural mandis for better price realisation.
 - Connects 1,389 mandis across 23 states and 4 UTs.
 - Enrolment: 1.76 crore farmers and 2.5 lakh traders.
- ◆ **Pradhan Mantri Fasal Bima Yojana (PMFBY):**
 - Launched: 13 January 2016.
 - Covers pre-sowing to post-harvest losses due to natural calamities.
 - Globally the largest crop insurance programme by enrolment and third by premiums.
 - 5549.40 lakh farmer applications insured.
- Premiums: 2% for kharif, 1.5% for rabi, and 5% for horticultural crops.
- ◆ **Soil Health Card Scheme:**
 - Provides farmers with soil quality assessments for better crop productivity.
 - Over 22 crore cards were distributed.
- ◆ **PM KISAN AI Chatbot (Kisan e-Mitra):**
 - Multi-language support in all 22 official languages.
 - Streamlines beneficiary queries, ensuring accessibility.
- ◆ **Pradhan Mantri Annadata Aay Sanrakshan Abhiyan (PM-AASHA)**
 - Launched in 2018.
 - Ensures remunerative prices for farmers' produce by setting the Minimum Support Price (MSP) at 50% above the cost of production for all 22 commodities.
- ◆ **Pradhan Mantri Kisan Maan-Dhan Yojana (PM-KMY)**
 - Launched on 12 September 2019.
 - Aims to provide financial security to small and marginal farmers in their old age.
 - Eligibility for farmers aged 18-40 years, contributing ₹55 to ₹200 monthly to the pension fund.
 - **Benefit:** Monthly pension of ₹3,000 for farmers aged 60+.
 - Government Contribution matches the farmer's contribution
- ◆ **Atal Pension Yojana (APY)**

- Launched on 9 May 2015.
- Provides pension coverage for workers in the unorganised sector.
- **Eligibility:** Individuals aged 18-40 years.
- **Government Contribution:** Co-contributes up to ₹1,000 annually for five years.
- Subscribers receive up to ₹5,000 monthly after 60 years of age.

◆ **Pradhan Mantri Jeevan Jyoti Bima Yojana**

- **Launched in** 2015.
- Life insurance scheme to enhance coverage among the population.
- **Premium:** ₹436 annually.
- **Eligibility:** Individuals aged 18-50 with a bank account.
- **Benefit:** ₹2 lakh death benefit, payable to the nominee.

◆ **Pradhan Mantri Krishi Sinchai Yojana (PMKSY)**

- **Launched on 1 July 2015.**
- Aims to enhance irrigation efficiency and ensure "Har Khet Ko Pani" (Water for Every Farm).
- Allocated ₹50,000 crore for 2015–2020, covering 78 lakh ha under micro-irrigation

◆ **Per Drop More Crop (PDMC)**

- Launched in 2015 under PMKSY.
- Enhance water use efficiency through precision irrigation (e.g., drip and sprinkler systems).
- Covered 78 lakh ha with micro-irrigation from 2015-16 to 2022-23.

◆ **Paramparagat Krishi Vikas Yojana (PKVY)**

- Launched in 2015.
- Promotes organic farming and climate-resilient systems.
- Financial assistance: ₹50,000/ha over three years, with ₹31,000 directly to farmers.

◆ **Rashtriya Krishi Vikas Yojana (RKVY-RAFTAAR)**

- **Revamped:** 2017-18.
- Aims to strengthen pre- and post-harvest infrastructure, agri-entrepreneurship, and value addition.
- RKVY Start-up Programme funded 1,524 agri-start-ups with ₹106.25 crore from 2019-20.

◆ **Digital Platform for Farm Mechanization and**

Technology

- **Initiative:** Part of *Digital India* (launched 2015).
- **Features:**
 - **Direct Benefit Transfer:** Simplifies subsidies for farm machinery acquisition.
 - **Farm Machinery Testing Portal:** Enables online submission and monitoring of machinery performance tests.
 - **FARMS Mobile App:** Provides a platform for renting and hiring agricultural equipment.

◆ **Farmers Collectives and FPOs**

- **Scheme:** Formation and Promotion of 10,000 Farmer Producer Organisations (FPOs) (launched 2020).
- **Budget:** ₹6,865 crore.
- **Key Features:**
 - Financial assistance: ₹18 lakh per FPO over three years.
 - Equity grant: Up to ₹2,000 per member (max ₹15 lakh per FPO).
 - Credit guarantee: Up to ₹2 crore for project loans.
 - Training and onboarding on e-NAM for better market access.
- **Impact:** 7,774 FPOs registered by 2023.

◆ **Stand-Up India Scheme**

- Launched on 5 April 2016.
- **Eligibility:** Non-individual enterprises with 51% ownership by SC/ST or women.
- **Loans:**
 - ₹10 lakh to ₹1 crore for greenfield enterprises.
 - Covers up to 75% of project costs (term loans + working capital).
 - Repayment tenure: Up to 7 years with an 18-month moratorium.

◆ **Pradhan Mantri Jan Dhan Yojana (PMJDY)**

- Launched on 15 August 2014.
- Aims for financial inclusion for underserved populations.
- **Achievements:**
 - **Accounts Opened:** Over 50 crore by August 2023.
 - **Deposits:** ₹2,03,505 crore.

- **Women Beneficiaries:** 56% of account holders.
- **Rural Focus:** 67% accounts in rural/semi-

- urban areas.
- **RuPay Cards Issued:** 33.98 crore.

GOVERNMENT SCHEMES MAKING THE PATH EASY FOR DIVYANGJAN

- ◆ **Global Context:** WHO estimates 40 crore differently abled individuals in developing countries face social and economic exclusion.
- ◆ **India's Context (2011 Census):**
 - **Population with Disabilities:** 2.1% of 1.23 billion.
 - **Literacy:** Out of 2.7 crore disabled individuals, only 1.5 crore were literate, though literacy rates have improved since.
- ◆ **Persons with Disabilities Act, 1995:**
 - Section 33 of the act recommends 3% reservation for disabled people in government posts (later increased to 4%).
- ◆ **Initiatives**
 - Renaming disabled individuals as **Divyangjan** by PM Modi to foster dignity and respect.
 - **Divyangjan Swavalamban Yojana:** Loans up to ₹50 lakh for enterprises at 5–9% interest.
 - **Education Loans:** Loans at 4% interest for higher education.
 - **Micro Finance Scheme (MFS):** Loans up to ₹60,000 for small enterprises.
 - **Unique Disability ID (UDID):** Centralised ID for accessing all schemes and enables concessions and benefits like education loans, travel discounts, and unemployment allowances.
- ◆ **Travel Concessions**
 - **Rail Travel:**
 - Up to 50% fare concession for Divyangjans and their assistants.
 - Requires ID from Divisional Railway Manager's office.
 - **Bus Travel:** Concessions in government buses.
 - **Air Travel:**
 - Up to 50% discount on Air India fares.
 - Eligibility: 80% disability for physical impairments, 100% for complete blindness.
- ◆ **National Divyangjan Finance and Development Corporation (NDFDC)**
 - Established in 1997.
 - Aims to ensure that every Divyangjan (differently abled individual) in India becomes self-reliant and economically independent.
 - **Loan Schemes by NDFC:**
 - **Divyangjan Swavalamban Yojana:** Loans up to ₹50 lakh for enterprises at an interest rate of 5–9%.
 - **Education Loans:** Offered at a 4% interest rate to support higher education.
 - **Micro Finance Scheme (MFS):** Loans up to ₹60,000 to support small-scale self-employment ventures.
 - **Skill Development:** Training provided to over 86,000 Divyangjans to enhance employability and entrepreneurial skills.
 - **Market Integration:** Organisation of *Divya Kala Melas* to promote products made by Divyangjans.
- ◆ **Assistance in Assistive Devices (ADIP Scheme)**
 - Launched in 1981 to assist persons with disabilities (PWDs).
 - Provides durable, scientifically manufactured assistive devices to enhance rehabilitation and independence.
 - Categories of disabilities covered increased from 7 to 21 in the last 8 years.
 - **2007–2014:** 16.49 lakh PWDs benefited at a cost of ₹488.26 crore.
 - **2014–2022:** 22.29 lakh PWDs benefited at a cost of ₹1381.03 crore.
- ◆ **National and State-Level Awards:** National awards by the Department of Empowerment of Persons with Disabilities on 3rd December (World Disability Day).
- ◆ **Disha Scheme**
 - Early intervention and school readiness for children up to 10 years.
 - Provides treatment, training, and family support.
 - Establishment of Disha Centres with day care facilities for at least 4 hours.

- Staff includes special teachers, doctors, physiotherapists, counsellors, and nurses.
- ◆ **Day Care Centre (Vikas Kendra)**
 - Provide care support to family members by taking care of PwDs during the day.
 - Day care facilities for at least 6 hours (8 AM to 6 PM).
 - Focuses on skill-building and vocational training.
- ◆ **SAMARTH**
 - Establish respite homes for PwDs from BPL and LIG families, including destitute persons.
 - Support for orphaned or abandoned children and those from distressed families.
- ◆ **Gharaunda (Group Home for Adults)**
 - Provide lifelong assured homes and quality care services for adults with disabilities.
 - Group homes with medical care and vocational activity support.
- ◆ **Niramaya Scheme**
 - Provide affordable health insurance for PwDs covered under the National Trust Act.
 - Health insurance coverage of up to ₹5 lakh for enrolled beneficiaries
- ◆ **Sahyogi Scheme**
 - Train caregivers to provide nurturing care to PwDs and their families.
 - Training at two levels: primary and advanced
- Courses.

◆ **Gyanprabha Scheme**

- Encourage PwDs to pursue higher education, vocational training, and professional courses for employment or self-employment.
- Financial assistance for course fees, transportation, books, and other expenses.

◆ **Prerna Scheme**

- Promote products and services made by PwDs.
- Financial support for participation in exhibitions and fairs.
- Incentives for registered organisations based on product sales by PwDs.

◆ **Sambhav Scheme**

- Establish resource centres across cities to provide access to aids and assistive devices.
- Centres maintain information about devices on the National Trust website.

◆ **Badhte Kadam**

- Increase awareness about disabilities covered under the National Trust Act.
- Supports registered organisations (ROs) to organise community awareness events.
- National Trust sponsors up to 4 events annually per RO.
- Focus on social integration and mainstreaming of PwDs.

ENSURING DIGNITY IN OLD AGE: A PATHWAY TO SOCIAL SECURITY FOR SENIOR CITIZENS

- ◆ **National Policy on Older Persons (1999)**
 - Provide state support to improve the quality of life for older persons.
 - Aligned with the UN General Assembly Resolution 47/56, which declared 1999 as the International Year of Older Persons.
- ◆ **National Action Plan for the Welfare of Senior Citizens (NAPSrC)**
 - Launched: 2021 by the Ministry of Social Justice and Empowerment.
 - Aims to promote healthy, dignified, and self-reliant living for senior citizens and to strengthen social and generational bonds.
- ◆ **National Social Assistance Programme (NSAP)**
 - Launched: 15 August 1995 under the Ministry of Rural Development.
 - Provide financial assistance to elderly, widows, and disabled persons below the poverty line (BPL).
 - Covers nearly 30 million beneficiaries in rural and urban areas.
- ◆ **Pradhan Mantri Vaya Vandana Yojana (PMVVY)**
 - Launched in May 2017 by LIC.
 - Eligibility: Exclusively for senior citizens aged 60 and above.
 - Provides an assured return with an 8% effective annual yield.
 - Maximum investment: ₹15 lakh per individual.

- Fixed pension based on the investment amount.
- Extended till March 2025.
- **Impact:** Over 4.49 lakh policies sold, totalling ₹6,646 crore investments.
- ◆ **Rashtriya Swasthya Bima Yojana (RSBY)**
 - Launched in October 2007 by the Ministry of Labour and Employment.
 - Health insurance for unorganised sector workers from BPL households.
 - Coverage: ₹30,000 for hospitalisation and critical illnesses under Senior Citizen Health Insurance Scheme (SCHIS).
- ◆ **National Programme for Health Care of the Elderly (NPHCE)**
 - Launched: 2010 by the Ministry of Health and Family Welfare.
 - Specialised and comprehensive healthcare services for senior citizens.
 - Focus on accessibility, affordability, and

infrastructure for elderly care.

- ◆ **Senior Able Citizens for Re-employment in Dignity (SACRED)**
 - Launched: October 1, 2021.
 - SACRED portal connects seniors with private enterprises for jobs matching their skills and experience.
 - Empowers older individuals to remain engaged and uphold dignity through employment.
- ◆ **Action Groups Aimed at Social Reconstruction (AGRASR)**
 - Encourages seniors to form Self-Help Groups (SHGs) for meaningful activities, such as creating marketable products.
- ◆ **SAGE Portal:**
 - Launched on June 4, 2021, to provide equity support for innovative solutions addressing challenges faced by senior citizens.

SOCIAL SECURITY OF SCHEDULED TRIBES AND SCHEDULED CASTES IN NORTH EASTERN REGION

- ◆ **Dharti Aaba Janjatiya Gram Utkarsh Abhiyan (DAJGUA):**
 - Launched by Prime Minister Narendra Modi on 2 October 2024 in Jharkhand.
 - Focuses on bridging gaps in social infrastructure, health, education, and livelihoods through 25 interventions.
 - **Total outlay:** ₹79,156 crore (Central share: ₹56,333 crore; State share: ₹22,823 crore).
 - Aims to benefit over 5 crore tribal people in tribal-majority and aspirational blocks.
- ◆ **Pradhan Mantri Dakshata Aur Kushalata Sampanna Hitgrahi (PM-DAKSH) Yojana**
 - Launched in 2020-21 as a Central Sector Scheme.
 - Includes SCs, OBCs, EBCs, DNTs, Safai Karamcharis, and waste pickers.
 - Aims to enhance the competency of target groups for self-employment and wage-employment, fostering socio-economic development
 - Age Criteria: 18–45 years.

○ Income Criteria:

- No income limit for SCs, Safai Karamcharis, and DNTs.
- Annual family income below ₹3 lakh for OBCs and ₹1 lakh for EBCs.



CABINET DECISION 18-09- 2024

Pradhan Mantri Janjatiya Unnat Gram Abhiyan

- Mission Aims at Saturation coverage of **tribal majority villages** and **tribal villages** in Aspirational Districts
- It will cover more than **63,000 villages** benefiting more than **5 crore tribal people**
- Total outlay of the scheme is **Rs. 79,156 crore**
- Mission comprises of **25 interventions** to be implemented by **17-line ministries** to achieve following goals:
 - **Goal-1:** Developing Enabling Infrastructure
 - **Goal-2:** Promotion of Economic Empowerment
 - **Goal-3:** Universalization of Access to Good Education
 - **Goal-4:** Healthy lives and Dignified Ageing



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23

A SAFETY NET FOR ALL: INDIA SCALES HEALTHCARE FOR SOCIAL SECURITY

- ◆ **Ayushman Bharat Digital Mission (ABDM):**
 - Establish a national digital health ecosystem ensuring universal coverage.
 - **Key Features:**
 - ABHA (Ayushman Bharat Health Account): Secure digital health records for individuals.
 - Services: Lab reports, prescriptions, diagnoses, and appointment scheduling via the ABHA app.
 - Focus: Security, confidentiality, and privacy of health information.
- ◆ **Aarogya Setu:**
 - Initially for COVID-19 tracking, now a National Health App.
 - Integration with ABDM: Enables creation of ABHA IDs and scheduling remote consultations via *e-Sanjeevani*.
- ◆ **e-Sanjeevani:**
 - World's largest telemedicine platform with two modes:
 - *e-Sanjeevani AB-HWC*: Provider-to-provider consultations.
 - *e-Sanjeevani OPD*: Patient-to-provider consultations via smartphones/computers
- ◆ **Employees' State Insurance Scheme (ESIS)**
 - Established under the Employees' State Insurance Act, 1948, as India's first major social security legislation.
 - **Recent Growth:**
 - **May 2024 Registrations:**
 - 23.05 lakh new workers enrolled.
 - 11.15 lakh young employees (under 25 years).
 - 4.47 lakh female workers and 60 transgender workers.
 - 20,110 new establishments registered.
- ◆ **e-RaktKosh**
 - A national platform for information about Blood Banks and Blood availability across India and has been developed by C-DAC under the initiative of Blood Cell, National Health Mission, Ministry of Health and Family Welfare, Govt. of India.

ETHICS - CASE STUDY

Q) As the Head of the Personnel Department in a Municipal Corporation, you are confronted with allegations of a 'ghost employees' scam, where funds have been fraudulently withdrawn using fictitious employee names. Media reports have alleged that local councilors and few officials are involved in the scam and the money was siphoned up by these two categories of people.

- Explain the situation from different perspectives and its repercussion on the overall system.
- What steps can you take to resolve the situation?

ETHICS - EXAMPLES

- Integrity:** In 1991, after the Indian government devalued the rupee, Finance Minister Manmohan Singh deposited the gains from his overseas bank account into the Prime Minister's National Relief Fund, without publicising it.
- Creativity/Empathy:** Seven girls from GVHSS, Vellarmala, performed a dance at the 63rd Kerala State School Arts Festival, reliving the horrors of the July 30 landslide in Wayanad that claimed over 300 lives. Despite the emotional trauma, they danced to honour the victims, showcasing the resilience & triumph of the human spirit.
- Human Dignity:** The Supreme Court ruled that a pattern of behavior causing mental cruelty to partner can be grounds for divorce, upholding a lower court's decision in a case where irreconcilable differences led to the dissolution of the marriage, with the man ordered to pay ₹50 lakh in alimony to his wife.
- Innovation:** Bliss Naturals, founded by Niveda Ravikumar and Goutham Soundararajan, produces eco-friendly, kenaf-based sanitary napkins that offer comfort and sustainability. The brand focuses on reducing plastic waste, empowering women, and supporting rural communities.
- Emotional Intelligence:** Proactive measures by the CISF, including personalized engagements, an online grievance portal, and 24x7 tele-counselling, have led to a 40% reduction in suicide rates among its personnel, dropping below the national average for the first time.
- Ethics is Public Administration:** B Glory, born on December 29, 2004, aboard INS Gharial during the 2004 tsunami rescue, was adopted by the Indian Navy, which supported her education and resettlement. Now 20, she aspires to join the Navy as an officer to repay the debt of gratitude for the life-saving intervention.
- Innovation:** The Telangana Police's Garuda Squad, a unique bird squad, trains eagles and kites to intercept rogue drones using nets, offering a cost-effective and efficient solution for securing no-fly zones. The squad has been operational since 2021.
- Social Responsibility:** The Akal Drug De-Addiction Centre in Punjab, led by 91-year-old Col Dr Rajinder Singh, has helped over 10,000 individuals overcome addiction through therapy, skill training, and support. Singh, drawing from his army experience, has been running the centre for 17 years and plans to expand its reach.
- AI Ethics:** Kunu Kisan allegedly murdered an 18-year-old woman in Odisha after she accused him of rape when she was a minor. The Police, using AI-powered CCTV systems, tracked the suspect by feeding the woman's image into the system, which identified her on a motorcycle with two others, and AI further narrowed down the suspects using criminal records, leading to Kisan's confession.
- Lack of integrity:** A 45-year-old government school teacher in Hathras, Uttar Pradesh, was suspended after four Class 6 girls accused him of 'bad touch' inside the school premises, with the school initiating an inquiry based on complaints found in a complaint box, though neither the school nor the parents have filed a police report.



MODEL ESSAY

"Man is still the most extraordinary computer of all"

Introduction

- Quote by former US President John F Kennedy
- Contrast between humans and artificial computers.
- Computers excel in speed and precision but they lack the creativity, intuition, and emotional depth of humans

Human Intelligence vs Artificial Intelligence

- **Adaptability:** Humans learn and solve problems without prior programming, unlike AI. *Eg:* Learning a language versus AI requiring extensive data.
- **Creativity:** Humans generate original ideas, while AI replicates patterns. *Eg:* Writing a novel versus AI-generated text.
- **Emotional Intelligence:** Humans understand emotions and empathy; AI cannot. *Eg:* A therapist versus a chatbot.
- **Ethical Reasoning:** Humans make moral decisions; AI lacks context.
- **Learning Efficiency:** Humans learn from minimal exposure; AI needs large datasets.
- **Intuition:** Humans rely on gut feelings, while AI follows data.
- **Cultural Understanding:** Humans grasp social nuances; AI struggles with context. *Eg:* Understanding sarcasm or humour.

Human Brain's Complex Functioning

- **Parallel Processing:** Humans handle multiple tasks at once
- **Memory and Association:** Linking past experiences to current situations.
- **Neuroplasticity:** The brain forms new connections throughout life
- **Complex Decision-Making:** Decisions based on logic, emotions, and intuition.

Limitations of Artificial Computers

- **Dependency on Human Input:** AI needs constant updates and data. *Eg:* AI failing without updates.
- **Lack of Intuition:** AI struggles with nuance and subtlety. *Eg:* Misinterpreting sarcasm.
- **Ethical Dilemmas:** AI lacks moral reasoning. *Eg:* Decisions in autonomous vehicles.
- **Limited Creativity:** AI generates based on existing data. *Eg:* AI mimicking, not creating, music.

Way Forward

- **Enhancing Productivity:** AI automates tasks, allowing humans to focus on complex work. *Eg:* AI in customer service, freeing humans for innovation.
- **Ethical AI Development:** AI must be developed responsibly to avoid bias and harm. *Eg:* Bias-free hiring algorithms.
- **Collaboration for Innovation:** Combining human creativity with AI's power leads to breakthroughs. *Eg:* AI in drug discovery, guided by human insight.
- **Continuous Learning:** AI improves with human feedback, and vice versa. *Eg:* AI refining recommendations on platforms like Netflix.

Conclusion

- AI should serve as an extension of human potential not a replacement.
- Focus on the responsible and ethical development of AI to ensure it benefits humanity.

Sample Quotes

- *Perplexity is the beginning of knowledge - Khalil Gibran*
- *No one has ever become poor by giving- Anne Frank*
- *Perseverance is not a long race; it is many short races one after the other- Walter Eliot*

MAINS JOT DOWN



GS- II - HEALTH

- ➡ Cornell University's innovative AnemiaPhone technology, now adopted by the Indian Council of Medical Research (ICMR), enables quick, accurate, and affordable assessment of iron deficiency.
- ➡ ICMR plans to incorporate this technology into its nationwide programs addressing anemia, women's health, and maternal and child health.

Anemia in India

- » Anemia is a condition characterized by a reduced number of red blood cells or lower-than-normal hemoglobin levels.
- » According to NFHS-5 data, anemia affects:
 - 59% of adolescent girls
 - 57% of women aged 15-49 years
 - 67% of children aged 6-59 months



GS- I - IMPORTANT PERSONALITIES IN NEWS

- ➡ Savitribai Phule, a prominent social reformer and educator, is honored on her birth anniversary on January 3.
- ➡ Born in Naigaon, Satara district, Maharashtra, she became the first headmistress of India's first girls' school in Pune.
 - » She dedicated her life to the education of marginalized communities, particularly Shudras and Ati-Shudras.
 - » In 1873, alongside her husband Jyotiba Phule, she pioneered the Satyashodhak marriage, advocating for marriages without dowry and at minimal costs.
 - » They also fought against child marriage and supported widow remarriage.
 - » A trailblazer in Marathi literature, she became the first modern poetess by publishing her poetry collection *Kavyaphule* in 1854. Savitribai's work embodied values of egalitarianism, justice, and unwavering conviction.



GS- II - EDUCATION

- ➡ The Centre has approved Rs 676.70 crore for infrastructure development of universities and colleges in Odisha under PM-USHA (Pradhan Mantri Uchchatar Shiksha Abhiyan).

About PM-USHA:

- » Launched in 2023 under the **Rashtriya Uchchatar Shiksha Abhiyan (RUSA)** scheme, PM-USHA is a Centrally Sponsored Scheme aligned with NEP 2020. It aims to fund state universities and colleges, including those in rural areas, to improve quality and meet prescribed standards.

Focus Areas:

- Equity, access, and inclusion in higher education
- Enhancing teaching and learning quality
- Accreditation of non-accredited institutions
- ICT-based digital infrastructure
- Improving employability through multidisciplinary approaches.



GS- I - INDIAN SOCIETY; WOMEN

- ➡ The Women Entrepreneurship Platform (WEP) of NITI Aayog has launched **EmpowHER Biz – Sapno Ki Udaan** to support women entrepreneurs.
- ➡ Initially established as an aggregator platform within NITI Aayog in 2018, WEP transitioned into a public-private partnership model in 2022.

About EmpowHER Biz

- » **Objectives:**
 - Empower women entrepreneurs by providing them with essential skills and resources.
 - Offer mentorship in key areas such as retail management, digital tools, financial literacy, and business development, supporting aspiring women entrepreneurs in their journey.



GS- III - AGRICULTURE

- ➡ The Union Ministry of Fisheries, Animal Husbandry, and Dairying launched **India's first Organic Fisheries Cluster in Soreng, Sikkim**, under the Pradhan Mantri Matsya Sampada Yojana (PMMSY).
 - » PMMSY aims to promote the Blue Revolution by ensuring sustainable fisheries development in India.
 - » It adopts a cluster-based approach to boost the sector's competitiveness, scale economies, and increase incomes. Organic fisheries focus on eco-friendly fish farming, avoiding harmful chemicals, antibiotics, and pesticides.



GS- III - INFRASTRUCTURE

- ➡ Indian Railways has achieved a major milestone with the completion of the Anji Khad Bridge, India's first cable-stayed rail bridge.
 - » **Location:** Reasi district, Jammu and Kashmir, part of the Udhampur-Srinagar-Baramulla Rail Link (USBRL)
 - » **Dimensions:**
 - Length: 725.5 meters
 - Height: 331 meters above the Anji River (tributary of the Chenab)
 - » **Significance:**
 - Enhances connectivity between Katra and Kashmir Valley
 - Expected to boost tourism and stimulate economic growth in Jammu and Kashmir.



GS- II - GOVERNMENT POLICIES AND INTERVENTIONS

- ➡ The Union Minister of Labour & Employment and Youth Affairs & Sports unveiled the multilingual functionality on the e-Shram Portal, enhanced by the Bhashini project, which now supports all 22 Scheduled Languages (previously available in only English, Hindi, Kannada, and Marathi).
 - ➡ **About the Bhashini Project:**
 - ➡ **Launched in** 2022, under the Ministry of Electronics and Information Technology (MeitY)
 - ➡ To eliminate language barriers and deliver content and services in local languages, as part of the National Language Translation Mission (NLTM).

- ➡ The Ministry of Petroleum and Natural Gas (MoPNG) reports that the number of LPG connections in India has more than doubled from 14.52 crore in 2014 to 32.83 crore in 2024, with 10.33 crore connections provided under the Pradhan Mantri Ujjwala Yojana (PMUY).

- ➡ **About PMUY (2016):**
 - » **Objective:** To provide clean cooking fuel (LPG) to rural and marginalized households using traditional fuels like firewood and coal.
 - » **Beneficiaries:** Adult women from SC, ST, and Pradhan Mantri Awas Yojana (Gramin) categories.

- ➡ The Union Minister of Ports, Shipping & Waterways announced key initiatives to enhance capacity at Kandla Port.

About Kandla Port:

- » **Established:** 1950s, replacing Karachi Port post-partition
- » **Official Name:** Deendayal Port (renamed in 2017)
- » **Location:** Kutch District, Gujarat, India
- » **Significance:**
 - India's second-largest port by cargo volume (after Paradip Port)
 - Serves as a major gateway for North, West, and Central India
 - Home to the Kandla Special Economic Zone (KASEZ), India's first SEZ, established in 1965.



GS- III - DEFENCE

- India and the U.S. will co-produce interoperable sonobuoys for the Indian Navy, as part of the U.S.-India Initiative on Critical and Emerging Technologies (ICET).

>About Sonobuoys:

- » Sonobuoys are air-launched, expendable electro-mechanical sensors that provide vital water temperature data to improve sonar accuracy. Sonar, which uses sound waves for ocean exploration and mapping, is essential for anti-submarine warfare and oceanographic research.

CHERRYPICKS OF THE WEEK

NANOPORE TECHNOLOGY

- It uses nano-sized holes in a thin membrane to detect changes in electrical potential as charged biological molecules pass through.
- It enables real-time sequencing of DNA or RNA directly from biological samples.
- It has potential application value for detection of disease markers, and non-invasive early diagnosis of cancer.

GRAVITATIONAL WAVES

- They are ripples in space-time that travel at the speed of light, causing objects in their path to stretch and compress.
- Predicted by Einstein in 1916 through his general theory of relativity, they result from massive accelerating objects disrupting space-time.
- In 2015, scientists used LIGO to detect gravitational waves for the first time.

DOZER PUSH MINING METHOD

- It employs automated machinery to enhance efficiency, control vibrations, and minimize flyrock.
- Advantages over traditional methods include faster coal recovery, cost-effectiveness, reduced weather delays, and lower risks to workers.

TIDAL TAIL

- It forms when two galaxies interact closely, with gravitational forces ("tidal forces") pulling stars and gas away during their close encounter or merger.
- These elongated structures provide insights into the formation of galaxies, including ultra-diffuse ones with very low surface brightness.

RADIO ACCESS NETWORK (RAN)

- It is a key component in **Wireless Telecommunication Systems** play a vital role in enabling devices like cell phones and computers to connect to networks using radio links. They support communication between user devices and the core network, which handles subscriber data and location details.
- Key Components:**
 - Antennas:** Convert electrical signals into radio waves for transmission.
 - Radios:** Convert digital data into wireless signals.
 - Baseband Units (BBUs):** Process and manage signals for smooth communication.