

# NEXT IAS

## SUMMARY OF DOWN TO EARTH

[1-15 MARCH, 2025]



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### SUBJECTIVE QUESTIONS

### MCQS

## Yamuna: Sand Mining & Riverbed Erosion

### Context

- Sand mining is visible on the Yamuna in Dehradun district, Uttarakhand. Once home to indigenous communities, the village was submerged in 2022 for the 120-megawatt **Vyasi Hydroelectric Power Project** on the river.

### About

- The Yamuna River is facing severe environmental challenges due to rampant sand mining and riverbed erosion.
- These activities have not only disrupted the river's ecological balance but also posed a threat to the livelihoods of communities dependent on the river.

### Impact of Sand Mining

- **Ecological Degradation:** The removal of sand from the riverbed disrupts the natural habitat of aquatic plants and animals.
  - It affects the food chain, leading to a decline in fish populations and other aquatic species.
- **Riverbed Erosion:** Excessive sand mining accelerates riverbed erosion, causing the river to change its course.
  - It can lead to the loss of fertile agricultural land and damage to infrastructure such as bridges and roads.
- **Water Quality:** Sand mining increases the turbidity of the river water, reducing its quality.
  - The increased sediment load can also clog irrigation channels and affect water supply for domestic and agricultural use.

- **Flooding:** The removal of sand weakens the river's natural floodplain, reducing its capacity to absorb floodwaters.
  - It increases the risk of flooding in nearby areas, endangering lives and property.

### Social and Economic Consequences

- **Livelihoods:** Many communities rely on the Yamuna River for their livelihoods, including fishing and agriculture. The degradation of the river's ecosystem threatens their income and food security.
- **Health Risks:** The increased turbidity and pollution of the river water pose health risks to communities that depend on the Yamuna for drinking water and sanitation.
- **Illegal Activities:** Unregulated sand mining is often associated with illegal activities, including corruption and exploitation of labor. Workers involved in illegal mining operations are subjected to poor working conditions and minimal pay.

### Mitigation Measures

- **Regulation and Enforcement:** Strengthening regulations and enforcement mechanisms to curb illegal sand mining activities.
  - It includes regular monitoring of mining sites and imposing strict penalties for violations.
  - In 2022, the **Uttarakhand High Court banned mechanised mining** of riverbed materials across the state.
- **Sustainable Mining Practices:** Promoting sustainable sand mining practices that minimize environmental impact.
  - It includes setting limits on the amount of sand that can be extracted and ensuring that mining activities do not disrupt the river's natural flow.

- **Community Engagement:** Involving local communities in the management and conservation of the river.
  - It includes raising awareness about the impact of sand mining and encouraging community-led initiatives to protect the river.
- **Restoration Projects:** Implementing river restoration projects to rehabilitate degraded riverbeds and floodplains.
  - It includes reforestation, soil conservation, and the creation of buffer zones to protect the river from further erosion.

## India's Extreme Weather Records in 2024

### Context

- In 2024, India experienced **extreme weather events on 322 out of 366 days**, highlighting the increasing frequency and intensity of climate-related disasters, surpassing the records of previous years.

### Record-Breaking Statistics

- In 2024, India faced extreme weather events on nearly 88% of the days, up from 87% in 2023 and 86% in 2022.
- These events included heat and cold waves, cyclones, lightning, heavy rain, floods, and landslides, affecting various regions across the country.
- The rising trend of extreme weather days has resulted in severe human and economic losses, with 3,472 fatalities in 2024, a 15% increase over three years.

### Regional Impact

- **Central India** experienced the highest number of extreme weather days in 2024, with 253 days marked by such events.
  - **Madhya Pradesh**, in particular, saw extreme weather for 185 days, the most in the country.
- **The Southern Peninsula** region also witnessed a significant increase, with 223 days of extreme weather, a 31% rise since 2022.
  - These regions faced devastating impacts on agriculture, with 4.07 million hectares of cropped land affected in 2024, an 84% increase from the previous year.

REGIONS	NUMBER OF EXTREME WEATHER DAYS IN 2022	NUMBER OF EXTREME WEATHER DAYS IN 2023	NUMBER OF EXTREME WEATHER DAYS IN 2024	% INCREASE COMPARED TO 2022
Central region	218	219	253	16
Northwest region	237	256	248	4.6
Southern Peninsula	170	214	223	31
East and Northeast region	196	226	217	11

Source: "India's Atlas on Weather Disasters", CSE-DTE Data Centre

### Types of Extreme Weather Events

- **Heat Waves:** The year was the hottest on record, with significant temperature increases across various regions.
  - Heat waves led to 459 deaths, highlighting the need for effective heat action plans.
- **Floods and Heavy Rains:** Floods and heavy rains caused 1,287 fatalities, with Kerala and Maharashtra being the worst affected states.
  - The increased frequency of intense rainfall events underscores the importance of robust flood management systems.
- **Lightning and Thunderstorms:** Lightning and thunderstorms claimed 1,374 lives,

making them the deadliest weather events of the year.

- Bihar reported the highest number of lightning-related deaths.
- **Cyclones:** Cyclonic storms caused widespread damage to coastal regions, leading to loss of life and property.
  - The increasing intensity of cyclones is a stark reminder of the need for enhanced coastal resilience.

### Climate Change and Its Implications

- The record-breaking statistics of 2024 reflect the profound impact of climate change on India's weather patterns.
- Events that once occurred once every century are now happening with alarming frequency, overwhelming vulnerable populations.
- The rising trend of extreme weather days and the resultant loss and damage highlight the high cost of climate change borne by farmers and communities.

## Biodiversity Leakage

### Context

- A recent study, published in the journal Science, has raised concerns about the **unintended consequences of conservation efforts** in wealthy nations that **may inadvertently exacerbate biodiversity loss** in other countries.
  - It highlights how local conservation gains in wealthy nations can result in net harm to global biodiversity.

### About Biodiversity Leakage

- It refers to the unintended transfer of environmental pressures from one region to

another due to conservation policies, trade regulations, or economic shifts.

- It mirrors carbon leakage, where strict emission controls in one country push polluting industries to less-regulated regions.

### Study's Findings

- **Loss of Species:** The study found that **consumption by high-income nations** was responsible for **13.3% of all species range loss worldwide**.
- **Key Contributors:** The United States, Germany, Japan, and China caused biodiversity **losses 15 times greater than their domestic impacts**.
  - The study highlighted that 18 out of the 24 countries analyzed had higher international than domestic impacts on biodiversity loss.

### Causes of Biodiversity Leakage

- **Displacement of Harmful Activities:** Logging bans, land conservation, or fishing restrictions often push exploitative activities into areas with fewer protections.
  - **Example:** A moratorium on logging in Indonesia has driven deforestation into neighboring Malaysia and Papua New Guinea.
- **Trade and Supply Chain Shifts:** When nations ban the import of illegally harvested timber or wildlife products, suppliers often find new markets with weaker enforcement.
  - **Example:** The European Union's regulations against deforestation-linked products have redirected trade flows to less-regulated Asian and African markets.

- **Policy Gaps and Governance Failures:** Conservation policies may focus on specific regions but fail to address systemic causes of biodiversity loss.
  - **Example:** In Latin America, protected areas have succeeded in reducing deforestation within their boundaries, but illegal logging has intensified outside them.
- **Global Economic Dynamics:** Rising demand for commodities like palm oil, soy, and beef often drives land-use changes, even as conservation efforts aim to curb deforestation.
  - **Example:** Efforts to curb Amazon deforestation have shifted soy production to the biodiverse Cerrado region in Brazil.

### Impacts of Biodiversity Leakage

- **Loss of Ecosystem Services:** When ecosystems are degraded in unprotected areas, local communities lose access to essential resources like clean water and fertile land.
- **Threats to Endangered Species:** Many species migrate across landscapes, and displacement of habitat destruction can harm already vulnerable populations.
- **Impact on Biodiverse Regions:** The United States' consumption had the most significant impact on wildlife in Central America, while China and Japan's demand affected species in the rainforest regions of Southeast Asia.
  - Additionally, almost half of all range losses at long distances from the 24 driver countries were of species in Madagascar, driven by deforestation for vanilla production.
- **Weakening of Conservation Efforts:** Leakage undermines the credibility and effectiveness of conservation policies, making it harder to achieve global biodiversity targets.
- **Social and Economic Disruptions:** Conservation-induced displacement can lead to conflicts between environmental goals and local livelihoods, particularly in developing regions.
- **Other key examples** are Fishing Restrictions and Overfishing Elsewhere, Deforestation Bans and Palm Oil Expansion, Carbon Offset Dilemma (displaced deforestation) etc.

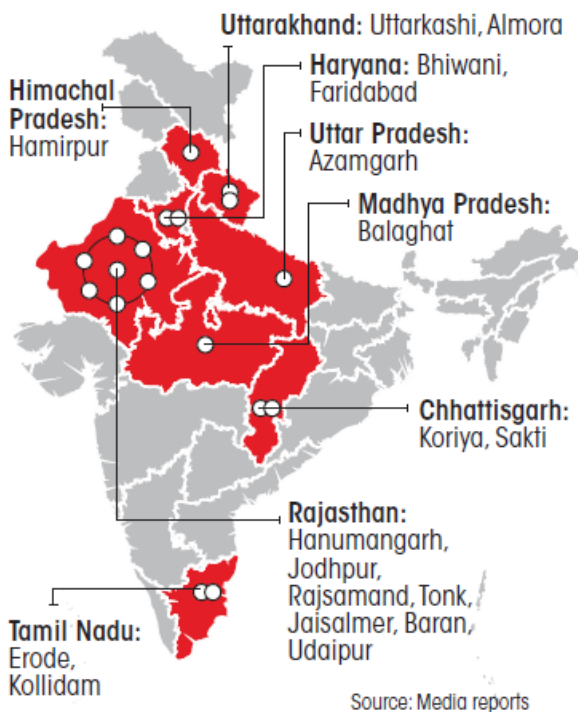
### Addressing Biodiversity Leakage

- **Integrated Land-Use Planning:** Coordinating conservation efforts across entire landscapes to prevent displacement of harmful activities.
- **Stronger Global Governance:** Enhancing international trade regulations and cooperation to ensure sustainability beyond protected areas.
- **Inclusive Conservation Policies:** Engaging local communities and Indigenous groups to create solutions that balance conservation and livelihoods.
- **Supply Chain Accountability:** Promoting responsible sourcing and certification schemes (e.g., FSC for timber, RSPO for palm oil).
- **Ecological Compensation Mechanisms:** Ensuring that conservation efforts do not create unintended environmental harm elsewhere.

## Push to Subsume Villages Into Towns in India

### Vanishing villages

Villages in at least 18 districts across 8 states have opposed their absorption into towns in the past five years



#### Context

- Fearing loss of autonomy and access to government schemes, several villages across India are protesting against the decision to change their status to town.
  - Recent push to subsume villages into towns goes against the spirit of the **73rd and 74th Constitutional Amendments**.

#### About

- India is experiencing an accelerating transformation in its **rural-urban landscape**, and **push to subsume villages into towns** has been driven by **urbanization policies, economic imperatives, and infrastructural expansion**.

- However, this shift has profound implications for rural employment schemes, especially the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA).

#### Drive Toward Urbanization

- **Increased Tax Revenues:** Urban local bodies (ULBs) can levy property taxes and other charges, generating more revenue than panchayats.
- **Infrastructure Expansion:** Towns attract higher investments in roads, electricity, water supply, and public services.
- **Political and Administrative Control:** Urban areas come under municipal governance, reducing local panchayat autonomy but increasing centralized urban planning.

#### MGNREGA and the Rural Employment Safety Net

- It is a **demand-driven scheme** ensuring **100 days of wage employment to every rural household** (*its applicability is limited to rural areas*) willing to do **unskilled manual work**.
  - Once a village is designated as a town, it loses access to MGNREGA.

#### Key Concerns

- **Disqualification from MGNREGA Benefits:** Once a village is reclassified as an urban area, its residents lose access to MGNREGA jobs.
- **Lack of Alternative Employment in Small Towns:** The informal economy dominates, offering unstable and low-paying jobs, which are insufficient to replace MGNREGA's wage security.
- **Disruption in Livelihoods:** MGNREGA supports marginal farmers, landless laborers, and women workers, many of

whom find it difficult to transition into urban employment.

- Without MGNREGA, these workers are forced into precarious, unregulated jobs with no social security benefits.
- **Erosion of Community Assets:** MGNREGA has contributed significantly to water conservation, afforestation, and rural infrastructure through community-based work.
  - As villages are urbanized, such local asset-building initiatives decline, affecting long-term rural resilience.

### MGNREGA and the 73rd & 74th Constitutional Amendments

- The **73rd Constitutional Amendment** empowered rural local self-governance through the **Panchayati Raj System**, granting them authority over various development functions, including employment generation, social justice, and infrastructure development. It mandated:
  - The formation of a three-tier system (Gram Panchayat, Block Panchayat, and District Panchayat).
  - Direct elections for Panchayat representatives.
  - Reservation for Scheduled Castes, Scheduled Tribes, and women.
  - The establishment of a State Finance Commission and State Election Commission to ensure financial and administrative autonomy.
- Similarly, the **74th Constitutional Amendment** strengthened **Urban Local Bodies (ULBs)** by creating **Municipalities, Municipal Councils, and Municipal Corporations**.

- These amendments sought to decentralize decision-making, ensuring greater citizen participation in governance and efficient service delivery at the local level.

### How MGNREGA and the 73rd Amendment Work Together?

- **Decentralized Planning:** Gram Panchayats prepare labour budgets and decide on projects based on local needs.
  - It ensures that employment schemes are demand-driven and community-oriented.
- **Social Audits and Accountability:** MGNREGA mandates social audits, empowering Gram Sabhas to monitor funds, reducing corruption, and ensuring transparency.
- **Capacity Building:** Panchayats receive training and financial resources to implement MGNREGA efficiently, fostering administrative decentralization.
- **Women's Empowerment:** With **50% of MGNREGA workers** being women, the scheme enhances female participation in decision-making at the village level, complementing the **one-third reservation for women in PRIs**.
- **Strengthening Local Economy:** MGNREGA wages boost rural purchasing power, leading to improved livelihoods and rural economic growth.

## Agroforestry in India

### Context

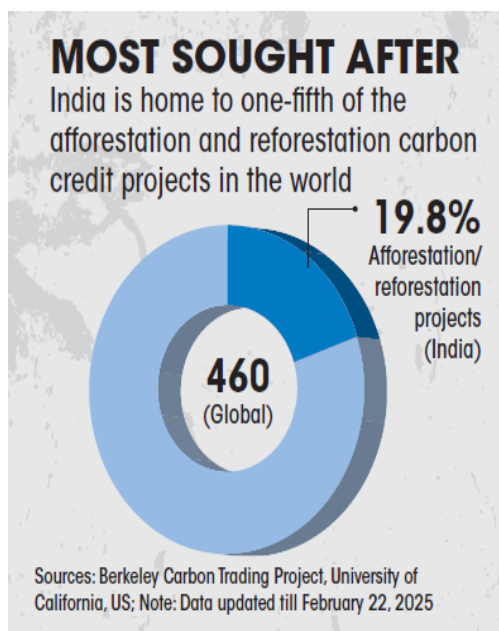
- Agroforestry is fast emerging as a win-win strategy to mitigate climate change and improve farmers' income.



- It is particularly so in India, home to one-fifth of the agroforestry carbon projects in the world.

**About the Agroforestry**

- It is the practice of integrating trees, crops, and livestock within the same agricultural landscape as a sustainable land-use system.
- It offers multiple benefits, including improving soil fertility, increasing biodiversity, and enhancing rural livelihoods.



**History and Evolution of Agroforestry in India**

- **Traditional systems** such as **agri-silviculture (crops and trees)** and **silvopastoral (trees and livestock)** have existed in rural India for generations.
- However, modern agroforestry gained momentum in the 1980s with the **National Wastelands Development Board** promoting tree plantation on degraded lands.

**Importance of Agroforestry (Policy Perspective)**

- **National Agroforestry Policy (2014):** The first-ever national policy dedicated to promoting agroforestry, ensuring access to

quality planting material, and simplifying tree harvest regulations.

- **Sub-Mission on Agroforestry (SMAF) under the National Mission for Sustainable Agriculture (NMSA):** A scheme aimed at increasing tree cover and enhancing farmers' income.
- **Forest Rights Act (2006):** Allowing forest-dwelling communities to sustainably manage and cultivate trees on forest lands.

**Types of Agroforestry Systems in India**

- **Agri-Silviculture:**
  - Cultivation of crops alongside trees.
  - Commonly practiced in states like Punjab and Haryana with poplar and eucalyptus plantations.
- **Silvo-Pastoral Systems:**
  - Integration of trees with livestock grazing.
  - Found in Rajasthan and Gujarat with acacia and fodder trees.
- **Agri-Horticulture:**
  - Combination of fruit trees with seasonal crops.
  - Widely practiced in Kerala and Maharashtra with mango, guava, and coconut plantations.
- **Home Gardens:**
  - A mix of vegetables, fruit trees, and medicinal plants in household backyards.
  - Predominant in southern and northeastern states.
- **Taungya System:**
  - Practiced in forested areas where farmers grow crops alongside newly planted trees.

- Common in Uttar Pradesh and West Bengal.

### Benefits of Agroforestry

- **Environmental Benefits:**
  - **Carbon Sequestration:** Trees absorb carbon dioxide, mitigating climate change.
  - **Soil Conservation:** Prevents erosion and improves soil fertility through organic matter accumulation.
  - **Biodiversity Conservation:** Supports wildlife by providing habitats and food sources.
  - **Water Conservation:** Reduces runoff and enhances groundwater recharge.
- **Economic Benefits:**
  - **Diversified Income Sources:** Farmers earn from timber, fruits, fodder, and medicinal plants.
  - **Employment Generation:** Agroforestry creates rural employment opportunities in nurseries, plantations, and wood processing.
  - **Resilience to Climate Change:** Trees act as windbreaks, reducing crop damage from extreme weather events.
- **Social Benefits**
  - **Improved Livelihoods:** Supports small farmers and tribal communities.
  - **Nutritional Security:** Provides fruits, nuts, and medicinal plants for household consumption.
  - **Traditional Knowledge Conservation:** Encourages indigenous agroforestry practices.

### Challenges in Agroforestry Adoption

- **Regulatory Hurdles:** Farmers often struggle with timber harvesting and transportation restrictions.
- **Lack of Awareness and Training:** Many farmers lack knowledge about suitable tree-crop combinations.
- **Market Uncertainty:** Unstable timber and non-timber product markets affect profitability.
- **Landholding Constraints:** Small and marginal farmers may not have enough land for agroforestry.

### Government Initiatives to Promote Agroforestry

- **Green India Mission:** Focuses on afforestation and sustainable forest-based livelihoods.
- **National Bamboo Mission:** Encourages bamboo cultivation as an agroforestry component.
- **Krishi Vigyan Kendras (KVKs):** Provide training and demonstrations on agroforestry techniques.

## Ancient India's Scientific Excellence

### Context

- Policymakers are obsessed by a fuddled idea of resurrecting a glorious civilisational past, and even IITs have fallen in line.

### About

- Ancient India has long been celebrated for its rich scientific and technological contributions to the world.
- From advanced mathematical concepts to pioneering surgical techniques, the

intellectual achievements of ancient Indian scholars and scientists have left an indelible mark on human civilization.

### Mathematics: Concept of Zero and Beyond

- The **concept of zero as a numeral**, first recorded by **Brahmagupta in the 7th century CE**, revolutionized arithmetic and algebra.
- Indian mathematicians like **Aryabhata (476 CE) and Bhaskara I (600 CE)** made significant strides in **trigonometry, algebra, and arithmetic**.
- **Aryabhata, in his treatise Aryabhatiya**, discussed the **approximation of pi ( $\pi$ ) and the concept of sine in trigonometry**, predating European mathematicians by centuries.

### Astronomy: Motion of Planets and Earth's Rotation

- The ancient Indian astronomical text **Surya Siddhanta (compiled around 400 CE)** contained sophisticated calculations about **planetary movements, eclipses, and even the concept of heliocentrism**—the idea that the Earth revolves around the Sun.
- **Aryabhata correctly described the Earth's rotation on its axis**, contradicting the prevailing geocentric model of the universe at that time.

### Medicine: Ayurveda and Surgery

- The practice of Ayurveda, dating back to the Vedic period, focused on holistic healing and herbal medicine.
- The **Charaka Samhita (compiled around 300 BCE)** provided extensive details on **anatomy, diagnosis, and treatment methods**.

- Meanwhile, **Sushruta Samhita**, attributed to Sushruta (circa 600 BCE), described **surgical procedures, including cataract surgery and rhinoplasty**.

- **Sushruta** is often referred to as the **'Father of Surgery'**.

### Metallurgy: Iron Pillar of Delhi'

- India was a leader in metallurgy, particularly in the extraction and processing of iron and zinc.
- The **Iron Pillar of Delhi**, which has resisted rust for over 1,600 years, remains a marvel of metallurgical ingenuity.
- The **process of zinc distillation was first mastered in India**, paving the way for advancements in chemical engineering.

### Philosophy and Science

- The **Nyaya, Vaisheshika, and Samkhya schools of philosophy** delved into logical reasoning, atomic theory, and cosmology.
- **Indian philosophers like Kanada and Patanjali** contributed to the understanding of natural laws and the principles of causality, bridging the gap between metaphysical inquiries and empirical observations.

## Remediating Legacy Waste in India

### Context

- Despite numerous policy updates and initiatives, India continues to grapple with a significant waste management crisis.

### About

- India faces several significant challenges in remediating its legacy waste, which could

derail its goal of **becoming garbage-free by 2025-26.**

- The **Swachh Bharat Mission (SBM)** and other policy reforms have made strides in addressing the issue, but the problem persists.

**Current State of Waste Management**

- India generates approximately 63.17 million tonnes of municipal solid waste (MSW) annually, with only about 33.40 million tonnes being treated.
- The discrepancy between waste generation and treatment highlights the challenges in the waste management sector.
- Factors such as unreliable data, seasonal fluctuations in waste composition, and inadequate infrastructure contribute to the inefficiency of waste management systems.

**Easy and yet so difficult**

Legacy wastes are easy to process due to their lower wet waste composition. However, the absence of recyclables and their reduced refuse-derived fuel potential make them economically less viable than fresh municipal solid waste

Composition	Fresh waste	Legacy waste
Organic matter	50%	0%
Semi-digested material (degraded organic matter)	0%	55%
Refuse-derived fuel (RDF)	20%	15%
Inert material	15%	27%
Recyclable	5%	1%
Construction and demolition waste	10%	2%
Treatment complexity	High	Low

Source: Authors' analysis, all percentages are approximate values

**Challenges in Waste Management**

- **Lack of Reliable Data:** Accurate data on waste generation and composition is crucial for effective waste management.
  - However, many cities lack consistent and reliable data, making it difficult to plan and implement waste management strategies.

- Frequent waste composition studies and daily measurements using weighbridges are essential for accurate data collection.
- **Inadequate Collection Mechanisms:** In many areas, especially those with difficult terrains and narrow lanes, waste collection mechanisms are insufficient.
  - The use of outdated equipment, such as pushcarts and tractor trolleys, hampers segregated waste collection.
  - Additionally, many households do not receive daily collection services, leading to improper waste disposal.
- **Technical and Administrative Challenges:** Waste management is not just a management issue but also a technical challenge.
  - Effective waste management requires proper administration, monitoring, and verification mechanisms.
  - Adequate infrastructure and strict enforcement of policies are necessary to ensure compliance and efficiency.

**Role of Policy Updates**

- **Decentralized Waste Management:** Implementing decentralized waste management systems can enhance efficiency and reduce the burden on central facilities.
  - Establishing dry waste deposition centers and linking them to centralized **Material Recovery Facilities (MRF)** can streamline waste processing.
- **Community Involvement:** Engaging local communities in waste management initiatives is vital.
  - Self-help groups and private contractors with trained staff can provide door-to-

door collection services, ensuring proper waste segregation and disposal.

- **Public Awareness and Education:** Raising awareness about the importance of waste segregation and proper disposal practices is crucial.
  - Public education campaigns can encourage responsible waste management behaviors among citizens.
- **Technological Innovations:** Adopting advanced technologies for waste processing and recycling can improve efficiency.
  - Innovations such as bio-decomposers, waste-to-energy plants, and automated sorting systems can enhance waste management capabilities.

## Rising Incidents of Stubble Burning in Madhya Pradesh

### Context

- Madhya Pradesh has surpassed Punjab in the number of stubble burning incidents, with over 10,000 cases reported in the 2024 season.
- It is attributed to the increasing cultivation of paddy in Madhya Pradesh, coupled with the lack of effective crop residue management practices.

### About Stubble Burning

- It is the practice of setting fire to crop residue after harvest.
- Punjab has historically been one of the major contributors to stubble burning in India. The state's farmers often burn leftover paddy stubble to quickly prepare their fields for the next crop season. It is faster and more economical than manual or mechanical clearing.

## Reasons For Rising Incidents of Stubble Burning in Madhya Pradesh

- **Expansion of Wheat Cultivation:** The state has increased wheat production, leading to more crop residue.
- **Delayed Harvesting & Pressure for Rabi Crops:** Farmers have limited time to clear fields before sowing, making burning the fastest option.
- **Limited Awareness & Alternatives:** Unlike Punjab, where crop residue management programs have been promoted, MP lags in subsidies and machinery distribution.
- **Changing Agricultural Practices:** Increased mechanization has resulted in more residue that cannot be manually removed.
- **Government Monitoring:** Punjab has been under strict surveillance with penalties, whereas MP has had relatively relaxed enforcement.

### Causes of Stubble Burning in Punjab

- **Short Sowing Window:** Due to the late harvesting of paddy and the need to plant wheat immediately, farmers resort to burning to expedite land preparation.
- **Mechanization Without Residue Management:** Combine harvesters leave behind unmanageable crop residues, and alternative disposal methods are costly.
- **High Cost of Alternatives:** Machines like the **Happy Seeder and Super Straw Management System (SMS)** require government subsidies, making them inaccessible for many farmers.
- **Water-Intensive Paddy Cultivation:** The Punjab Preservation of Subsoil Water Act (2009) delayed paddy sowing to conserve groundwater, but this compressed the time

available for wheat sowing, increasing reliance on burning.

### Impact of Stubble Burning in Punjab

- **Severe Air Pollution:** The release of particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>) worsens air quality, especially in Delhi-NCR.
- **Health Hazards:** Respiratory diseases like asthma and bronchitis spike due to smog formation.
- **Soil Degradation:** Burning depletes soil nutrients and microbial activity, increasing dependence on chemical fertilizers.
- **Climate Change Contribution:** Greenhouse gases like CO<sub>2</sub>, CO, and methane are released, exacerbating global warming.

### Efforts Made By Punjab

- Punjab has implemented various measures, including providing subsidies for machinery like **Happy Seeders and Super Straw Management Systems**, which help manage crop residue without burning.
- Additionally, awareness campaigns and strict enforcement of regulations have contributed to a decline in stubble burning cases.
- As of November 2024, Punjab reported a 70% reduction in farm fire cases compared to previous years.

### Measures to Address Stubble Burning

- **Promoting Alternative Practices:** Providing subsidies and incentives for machinery that can manage crop residue without burning. Encouraging the use of bio-decomposers and other eco-friendly methods.
- **Awareness Campaigns:** Educating farmers about the harmful effects of stubble burning and the benefits of alternative practices.

- **Policy and Enforcement:** Strengthening regulations and ensuring strict enforcement to deter farmers from burning crop residue.
- **Research and Innovation:** Investing in research to develop cost-effective and efficient crop residue management technologies.

## PRELIMS

### Gypsum Mining in India

#### Context

- Residents of Rajasthan village revive land destroyed due to gypsum mining, see return of native plants and animals.

#### Gypsum Reserves and Mining in India

- India's gypsum reserves are estimated at around **1,286 million tonnes, with Rajasthan accounting for over 80%** of the total reserves.
- Other states with notable gypsum deposits include **Gujarat, Jammu and Kashmir, and Tamil Nadu**.
- The mineral is extracted through both open-pit and underground mining methods, depending on the depth and quality of the deposits.
- The mining of gypsum is primarily carried out by public sector enterprises such as **FCI Aravali Gypsum and Minerals India Limited (FAGMIL)**, which operates under the **Ministry of Chemicals and Fertilizers**.

#### Economic Importance

- Gypsum is a **critical raw material** for the construction industry, used in the production of **cement, plaster, and drywall**.

- It is **essential for agriculture**, where it serves as a **soil conditioner and a source of calcium and sulfur for crops**.
- The demand for gypsum has been steadily increasing, driven by India's rapid urbanization and the expansion of its agricultural sector.

### Environmental Challenges

- **Habitat Disruption:** Mining activities can lead to the destruction of natural habitats, affecting local biodiversity.
- **Soil Erosion:** The removal of topsoil during mining operations can result in soil erosion, reducing land fertility.
- **Water Pollution:** Mining processes can contaminate nearby water sources with sediments and chemicals, impacting aquatic ecosystems and local communities.
- **Air Pollution:** Dust generated during mining and processing can contribute to air pollution, posing health risks to workers and residents.

### Sustainable Mining Practices

- **Rehabilitation of Mined Areas:** Restoring mined areas by replanting vegetation and creating habitats for wildlife can mitigate environmental damage.
- **Efficient Resource Utilization:** Implementing advanced technologies to maximize resource extraction and minimize waste can enhance the efficiency of mining operations.
- **Community Engagement:** Involving local communities in decision-making processes and ensuring that mining activities benefit them economically and socially.

- **Regulatory Compliance:** Strengthening regulations and monitoring mechanisms to ensure that mining activities adhere to environmental standards.

## African Urban Heat Summit & Africa's First Heat Action Plan

### Context

- Recently, Sierra Leone's capital Freetown launched **Africa's first heat action plan** during the inaugural African Urban Heat Summit.

### About the African Urban Heat Summit

- It underscored the urgent need for collaborative solutions to mitigate the impacts of extreme heat.
  - It emphasizes the importance of sustainable urban planning and the integration of green infrastructure to combat the urban heat island effect.
- Key discussions revolved around the challenges posed by urban heat islands, rapid urbanization, and climate change.
- **Themed:** Building Heat-Resilient African Cities: Tackling Urban Heat Through Innovation, Education, and Action

### Key Components of Africa's First Heat Action Plan

- **Cooling Corridors and Green Spaces:** The creation of shaded areas and green infrastructure to reduce heat exposure and improve urban livability.
- **Infrastructure Adaptation:** Upgrading urban infrastructure to withstand rising temperatures and minimize heat-related risks.
- **Protective Measures for Vulnerable Groups:** Implementing programs to

safeguard the health and well-being of women, children, and the elderly.

- **Public Awareness Campaigns:** Educating communities about heat-related risks and promoting adaptive behaviors.

## Pradhan Mantri Annadata Aay Sanrakshan Abhiyan (PM-AASHA) Scheme

### Context

- Recently, the Union Government has approved the continuation of the Pradhan Mantri Annadata Aay Sanrakshan Abhiyan (PMAASHA) scheme up to 2025-26.

### About the PM-AASHA

- It is an **umbrella scheme** aimed to ensure remunerative prices for farmers' produce and stabilize the prices of essential commodities.
- It aims to protect the income of farmers and enhance agricultural productivity.

### Components of PM-AASHA

- **Price Support Scheme (PSS):** Government procures notified **pulses, oilseeds, and copra at the Minimum Support Price (MSP)** directly from pre-registered farmers **through central nodal agencies** such as the National Agricultural Cooperative Marketing Federation of India (NAFED) and the National Cooperative Consumers' Federation of India (NCCF).
- **Price Deficiency Payment Scheme (PDPS):** It aims to **compensate farmers for the difference between the MSP and the market price** of their produce. It is particularly beneficial for crops that are not covered under the PSS.

- **Private Procurement & Stockist Scheme (PPSS):** Under this scheme, **private entities are allowed to procure crops at the MSP** and store them for future sale. It helps in reducing the burden on government agencies and promotes efficient market operations.

### Recent Developments

- The Union Cabinet has approved the continuation of the PM-AASHA scheme during the 15th Finance Commission cycle up to 2025-26.
- The government has announced the procurement of tur (pigeon pea), urad (black gram) and masoor (red lentil) up to 100% of the state's production for the 2024-25 procurement year.

## International Finance Corporation (IFC)

### Context

- Recently, the **International Finance Corporation (IFC)** decided against investing in a proposed US \$40 million loan for **waste-to-energy incineration projects** in Gujarat.

### About the International Finance Corporation (IFC)

- It is a **private lending arm of the World Bank**, established in 1956.
- It aims to promote sustainable economic development by investing in private enterprises, mobilizing capital, and providing advisory services.

### Mission and Objectives

- **Mobilizing Financial Resources:** The IFC provides **debt and equity financing** to private sector projects, helping businesses



access the capital they need to grow and thrive.

- **Promoting Competitive Markets:** By supporting businesses and fostering competition, the IFC helps **create dynamic and resilient markets** that drive economic growth.
- **Creating Jobs and Delivering Services:** The IFC's investments generate employment opportunities and deliver essential services, such as healthcare, education, and infrastructure, to underserved communities.
- **Supporting Sustainable Development:** The IFC prioritizes projects that promote environmental sustainability, social inclusion, and good governance.

### Key Areas of Focus

- Agriculture and Food Security;
- Healthcare and Education;
- Infrastructure and Urban Development;
- Financial Inclusion;
- Climate Change and Environmental Sustainability;

## Red Rot Fungal Disease

### Context

- A fungal disease has hit the most widely sown sugarcane variety in Uttar Pradesh, threatening the country's sugar production.

### About the Red Rot Fungal Disease

- Red Rot is a devastating fungal disease that affects sugarcane, one of the most important cash crops in India.
- It is caused by the **fungus *Colletotrichum Falcatum***.

### Spread of Red Rot

- **Infected Planting Material:** The use of infected seed cane is a primary source of disease spread. The fungus can survive in the planting material and infect new crops.
- **Soil and Water:** The fungus can persist in the soil and be transmitted through irrigation water. Flooded fields and waterlogged conditions favor the spread of the disease.
- **Mechanical Transmission:** Agricultural tools and machinery used in infected fields can carry the fungal spores to healthy plants.

### Management and Control

- **Cultural Practices:**
  - **Crop Rotation:** Rotating sugarcane with non-host crops can help reduce the fungal inoculum in the soil.
  - **Sanitation:** Removing and destroying infected plant debris can prevent the spread of the disease.
  - **Resistant Varieties:** Planting disease-resistant sugarcane varieties can significantly reduce the incidence of Red Rot.
- **Chemical Control:**
  - **Fungicides:** The application of fungicides can help control the spread of Red Rot. However, it is essential to use them judiciously to avoid resistance development.
- **Biological Control:**
  - **Antagonistic Microorganisms:** The use of beneficial microorganisms that inhibit the growth of *Colletotrichum Falcatum* can be an effective biological control strategy.

## Ropa Valley of Kinnaur

### Context

- To combat the snow shortage, farmers in Kinnaur have devised an ingenious solution. They transport snow from higher elevations, where it remains frozen for longer durations, to their apple orchards.

### About

- Recently, Himachal Pradesh experienced a 77% reduction in precipitation, leading to a drastic decrease in snowfall.
  - It has created drought-like conditions in the soil, which is essential for the growth and development of apple trees.

### Ropa Valley

- It is located in Kinnaur district, **situated near the India-Tibet border**, along the banks of the **Ropa River, a tributary of the Sutlej River**.
- The lack of moisture has left farmers in the **Ropa Valley of Kinnaur** staring at the prospect of a loss-making low yield.

### Impact on Apple Production

- The reduced snowfall and subsequent drought conditions have had a significant impact on apple production in Kinnaur.
- The lack of moisture has led to poor fruit development and decreased agricultural output.
- Additionally, the warmer winters and early flowering have resulted in premature bud development, further affecting the quality of the apples.
- Farmers are also facing increased risks of fungal infections and plant diseases due to the absence of snow cover.

## SUBJECTIVE QUESTIONS

1. Analyze the key factors contributing to India's extreme weather records, and discuss the socio-economic and environmental impacts of these events.
2. Discuss the concept of biodiversity leakage and analyze its implications for global biodiversity conservation. What strategies can be implemented to mitigate this issue?
3. Critically evaluate the implications of subsuming villages into towns in India. How does this transition impact rural communities in terms of socio-economic, cultural, and environmental aspects?
4. Examine the role of agroforestry in promoting sustainable agriculture in India. Discuss the ecological, economic, and social benefits of integrating trees with crops and livestock. What challenges do farmers face in adopting agroforestry practices?
5. Critically analyze the environmental, social, and economic challenges associated with remediating legacy waste in India. Discuss the effectiveness of existing policies and technologies in addressing this issue and suggest innovative approaches to ensure sustainable waste management in the country.

## MCQs

1. The *Vyasi Hydroelectric Power Project*, sometimes appeared in the news, is which one of the following rivers?
  - (a) Ganga
  - (b) Yamuna
  - (c) Satluj
  - (d) Chenab

**2. Consider the following statements:**

1. The concept of zero as a numeral was first recorded by Brahmagupta in the 7th century CE.
2. Aryabhata discussed the approximation of pi ( $\pi$ ) and the concept of sine in trigonometry.

Which of the statements given above is/are correct?

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

**3. Which one of the following best describes the term 'biodiversity leakage'?**

- (a) It is a misleading advertisement in the context of environmental benefits of its products or practices.
- (b) It is the process of replanting trees in an area that previously had a forest.
- (c) It is the buying and selling of carbon credits to reduce greenhouse gas emissions.
- (d) It refers to the unintended transfer of environmental pressures from one region to another due to conservation policies, trade regulations, or economic shifts.

**4. Consider the following statements:**

1. Surya Siddhanta, an ancient Indian astronomical text, contained sophisticated calculations about planetary movements, and eclipses.
2. Heliocentrism talks about the idea that the Earth revolves around the Sun.

Which of the statements given above is/are correct?

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

**5. Consider the following statements:**

1. Charaka Samhita provided extensive details on anatomy, diagnosis, and treatment methods.
2. Sushruta Samhita described surgical procedures, including cataract surgery and rhinoplasty.

Which of the statements given above is/are correct?

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

**Answer Key:** \_\_\_\_\_

**1. (b) 2. (c) 3. (d) 4. (c) 5. (c)**

