NEXT IAS

SUMMARY OF
DOWN TO EARTH

[1–15 APRIL, 2025]

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[1–15 April, 2025]

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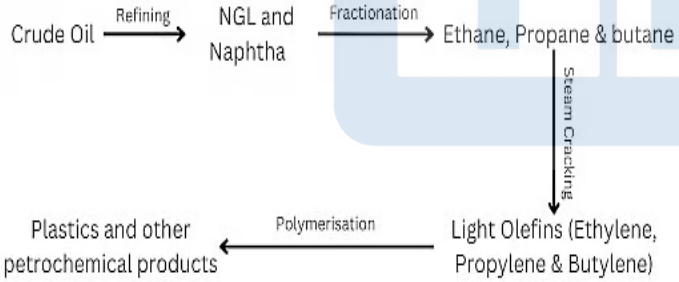
'Lie-cycling' of Plastics

Context

- Only about 9% of all plastic ever produced has been successfully recycled and it presents the greatest challenge of any material in the municipal solid waste stream.

Fossil Origins

- Nearly all plastics are made from fossil fuels-based petrochemicals.
- These chemicals are produced by using **Natural Gas Liquids (NGL)** and **naphtha** created from **crude oil during the refining process** as **feedstocks (raw materials).**
- For producing petrochemicals, ethane, propane and butane are separated from NGL through different stages of a process called **fractionation**.
    - Further, these petrochemicals are then converted into **light olefins viz., ethylene, propylene and butylenes,** respectively through steam cracking.
- These olefins are the fundamental chemical building blocks of petrochemical products including plastics.



Current Status

- At present, globally, petrochemicals and plastics account for 14% of total oil demand and eight% of the gas demand.
- According to the **International Energy Agency (IEA)**, petrochemicals and plastics will account for approximately 50% of oil demand and 58% of gas demand by 2050.
- OECD warns that without urgent action, plastic production is predicted to triple by 2060 to 1.2 billion metric tonnes.

Reality of Plastic Recycling

- **Challenges in Recycling:** Plastics are derived from fossil fuels, making them cheap to produce but difficult to recycle.
    - The process often involves high costs and energy consumption, limiting its feasibility.
    - Many types of plastic are non-recyclable due to contamination or the complexity of their chemical composition.
- **Global Trends:** Despite efforts to promote recycling, the majority of plastic waste ends up in landfills, oceans, or is incinerated.
    - It contributes to environmental degradation and the release of harmful microplastics.

Alarming Impacts of Plastics on Biodiversity

- According to a study published in the Proceedings of the National Academy of Sciences (PNAS), **microplastics may reduce photosynthesis rates** by as much as 18%.
- Study finds that the prevalence of microplastics leads to average reductions of 7.05-12.12% in photosynthesis across terrestrial plants, marine algae and freshwater algae.
- It is estimated to cause an annual loss of 109.73 - 360.87 million tonnes for crop production and 1.05-24.33 million tonnes for seafood production globally.

Why Recycling Gets Undue Attention?

- **Focus on Individual Responsibility:** Governments and corporations often emphasize individual-centric sustainability

practices, such as recycling, while neglecting systemic changes to reduce plastic production.

- **Techno-Fixes:** Recycling is often presented as a 'techno-fix' to the plastic crisis, overshadowing the need for policies that address the root causes of plastic overproduction.

Way Forward

- **Reducing Plastic Production:** A shift towards reducing plastic production and promoting alternatives, such as biodegradable materials, is essential to tackle the crisis effectively.
- **Policy Interventions:** Governments must implement stricter regulations on plastic manufacturing and invest in sustainable waste management systems.
- **Public Awareness:** Educating the public about the limitations of recycling and encouraging sustainable consumption practices can drive meaningful change.

High Rice Prices Amid Positive Production Trends

Context

- According to the UN Food and Agriculture Organization, **global paddy production** is expected to reach a record 543 million tonnes in 2024-25, driven by good crops in India and favourable weather conditions in Cambodia and Myanmar.

Global Production Outlook

- Global rice prices continue to stay high in 2024 and early 2025—even though production is strong.
- While major producers like India, Vietnam, and Thailand reported good yields, several external factors are keeping prices elevated.

Rice Market Snapshot (2024–2025)

- Global production rose by ~1.5% in 2024, led by strong monsoons in South and Southeast Asia.
- India harvested a bumper crop but maintained export bans on non-basmati rice into 2025, citing domestic price concerns.
- Thailand's rice exports hit a 5-year high, but prices surged due to strong global demand and higher freight costs.
- FAO's Food Price Index showed rice prices peaked in mid-2024 and stayed 25–30% higher than the 5-year average into Q1 2025.

Why Are Prices Still High?

- **Export Controls:** India's 2023 export ban continues in 2025. This removed nearly 40% of the global low-cost rice supply, tightening international markets.
- **Climate Volatility:** El Niño conditions in 2024 delayed planting in parts of Southeast Asia, triggering fears of reduced output later in 2025.
- **Higher Costs:** Fuel and fertilizer prices, though lower than 2022 peaks, remain high. These costs get passed to consumers.
- **Currency and Inflation:** Weaker currencies in Africa and parts of Asia made imports costlier. Many governments scaled back rice subsidies, raising local prices.
- **Panic Buying:** Governments and bulk buyers stockpiled rice in 2024 to hedge against global shocks, straining supply.

Impact

- **Africa:** Rice import bills rose by over 35% in countries like Ghana and Nigeria.
- **Middle East:** Price-sensitive markets faced shortages of affordable rice.

- **Latin America:** Brazil boosted domestic production but still saw 12–15% food inflation.

Safety in Coal & Lignite Mines

Context

- Recently, the Union Minister of Coal and Mines informed that some 226 people have died due to accidents in coal and lignite mines across the country since 2020.

Coal & Lignite Mines in India

- India is one of the largest producers of coal and lignite, with vast reserves that play a crucial role in the country's energy security.
- Total coal reserves: 320 billion tonnes:
    - **Coal Reserves and Production:** The distribution of coal reserves in India is concentrated in a few states like **Odisha (25.47%), Jharkhand (23.58%), Chhattisgarh (21.23%), West Bengal (8.72%) and Madhya Pradesh (8.43%)**
- These states account for **approximately 85% of the total coal reserves** in India.
    - Total estimated reserves of **lignite** as on 01-04-2024 stood at **47.30 billion tonnes.** The **highest reserves of lignite** are located in the **state of Tamil Nadu (79%).**
        - **Annual coal production:** 950 million tonnes, meeting 85% of domestic demand.
        - India remains the second-largest coal producer globally, after China.
- **Energy Mix (Sources and Shares):** Coal (48%); Oil (28%); Natural Gas (8%); Renewables (12%); and Nuclear (4%).

Major Coal & Lignite Mines in India

- **Coal India Limited (CIL):** With operations across multiple states, CIL is India's largest coal producer.
- **Neyveli Lignite Corporation (NLC)**: Based in Tamil Nadu, NLC is the leading lignite mining company in India.
- **Bharat Coking Coal Limited (BCCL)**: Located in Dhanbad, Jharkhand, BCCL specializes in coking coal production.
- **Eastern Coalfields Limited (ECL):** Operating in Asansol, West Bengal, ECL is a key subsidiary of CIL.
- **Shree Giriraj Mines & Minerals:** Located in Bundi, Rajasthan, this mine contributes to lignite production.

Key Safety Challenges in Coal & Lignite Mines

- **Mine Collapses & Structural Failures:** Weak geological formations can lead to sudden collapses, endangering workers.
    - Proper reinforcement and monitoring systems are essential to prevent accidents.
- **Gas Explosions & Toxic Emissions:** Methane and carbon monoxide buildup pose severe risks.
    - Ventilation systems and gas detection technologies help mitigate dangers.
- **Health Hazards:** Prolonged exposure to coal dust can cause pneumoconiosis (black lung disease).
    - Regular health screenings and protective gear are crucial for miners' well-being.
- **Equipment Malfunctions:** Faulty machinery can lead to fatal accidents.
    - Routine inspections and maintenance ensure operational safety.

Safety Regulations & Measures

- **Government Policies:** India's Mines Act, 1952, and Coal Mine Regulation-2017 set strict safety standards.
  - The Directorate-General of Mines Safety (DGMS) oversees compliance and enforcement.
  - **Star Rating of Mines:** Introduced to rank mines based on safety, production, and environmental performance.
  - Online Accident Reporting Portal for transparency.
  - 'Mission Zero Harm' under CIL to build a strong safety culture.
- **Technology Integration:** AI-powered monitoring systems detect early signs of instability.
  - Automated ventilation and gas detection improve workplace safety.
- **Training & Awareness:** Regular safety drills and education programs empower workers.
  - Encouraging a safety-first culture reduces human errors.

Conclusion

- Ensuring safety in coal and lignite mines requires a combination of regulatory oversight, technological advancements, and worker education.
- As mining operations expand, continuous improvements in safety protocols will be essential to protect lives and sustain the industry.

Genetic Study Reveals Hidden Chapter in Human Evolution

Context

- Recently, a study published in **Nature Genetics** challenges long-held assumptions about the origins of modern humans, revealing a complex history of divergence and interbreeding among ancient populations.

Key Findings

- **Divergence and Reunion:** The study found that modern humans descended from at least two ancestral populations that diverged approximately 1.5 million years ago.
  - These groups remained separate for over a million years before reuniting around 300,000 years ago, contributing to the genetic makeup of modern humans.
- **Genetic Contributions:** One group contributed 80% of the genetic material found in modern humans, while the other contributed 20%.
  - This ancient mixing event predates the well-documented interbreeding with Neanderthals and Denisovans, which occurred around 50,000 years ago.
- **Methodology:** Researchers used advanced computational tools, including the 'cobraa' algorithm, to analyze modern human DNA.
  - The study relied on data from the 1000 Genomes Project, which includes genetic information from populations across Africa, Asia, Europe, and the Americas.

Implications for Human Evolution

- **Complex Origins:** The findings challenge the traditional view that modern humans evolved from a single, continuous lineage in Africa.
  - Instead, they suggest a more intricate evolutionary process involving multiple groups that developed independently before merging.

- **Global Genetic Legacy:** Unlike Neanderthal DNA, which constitutes about 2% of the genome in non-African populations, this ancient genetic mixing event contributed up to 10 times more and is present in all modern humans.
- **New Research Directions:** The study opens avenues for further exploration into the genetic diversity of ancient populations and their impact on modern human traits.

Jude: Tropical Cyclone

Context

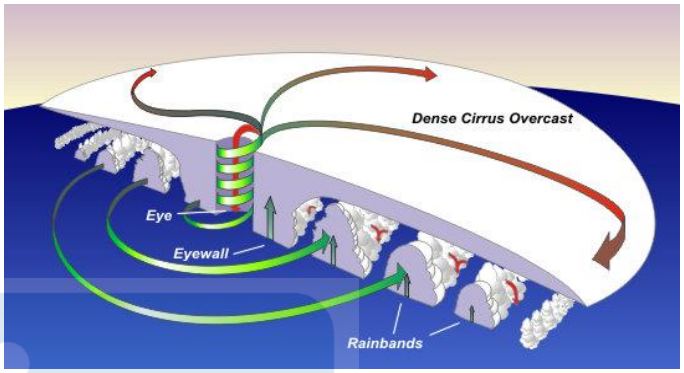
- **Mozambique** was hit with a cyclone, named Jude, which led to flooding in major river basins.

About the Tropical Cyclones

- These are intense, rotating weather systems that originate over warm tropical oceans and are characterized by strong winds, heavy rain, and storm surges.
- These are known by different names in different regions:
  - **Hurricanes**:Atlantic/Northeast Pacific
  - **Typhoons:** Northwest Pacific
  - **Cyclone:** South Pacific & Indian
- The **Saffir-Simpson Hurricane Wind Scale** is used for hurricanes (Atlantic & Northeast Pacific).

How Do Tropical Cyclones Form?

- Tropical cyclones require several key ingredients to form:
  - Warm ocean waters (≥ 26.5°C)
  - Moist air in the lower and middle levels of the troposphere
  - Low wind shear (minimal change in wind speed/direction with height)
  - A pre-existing weather disturbance (e.g., tropical wave)
- These conditions encourage the rise of moist air, leading to condensation, heat release, and further uplift, creating a positive feedback loop that fuels the storm.



Structure of a Tropical Cyclone

- Tropical cyclones consist of:
  - **Eye:** A calm, clear center with light winds.
  - **Eyewall:** Surrounds the eye with the most intense winds and rainfall.
  - **Rainbands:** Spiral bands of thunderstorms extending from the center.

Hazards Associated with Tropical Cyclones

- Tropical cyclones bring multiple threats:
  - **Storm Surge:** Coastal flooding from elevated sea levels.
  - **Heavy Rainfall & Flooding:** Often extending far inland.
  - **High Winds:** Damaging structures, trees, and power lines.
  - **Tornadoes:** Possible in outer rainbands.

Climate Change & Cyclones

- Research suggests that climate change may be affecting tropical cyclones by:
  - Increasing rainfall intensity
  - Rising sea surface temperatures → more potential energy
  - Slower storm movement, leading to prolonged impacts
  - Higher frequency of Category 4–5 storms

US Tariffs on Drugs and the End of WTO

Context

- The United States' recent imposition of tariffs on pharmaceutical imports has sparked concerns about rising drug prices and potential disruptions in global supply chains.

US Tariffs on Pharmaceuticals

- **Policy Overview:** The Trump administration announced a 25% tariff on imported drugs, particularly targeting supplies from India, Canada, and Europe.
  - While pharmaceuticals were initially exempt, concerns remain about future tariff expansions.
- **Impact on Drug Prices:** Analysts predict a 17.5% increase in generic drug prices due to tariffs.
  - Cancer treatments could see price hikes of $8,000–$10,000 for a six-month supply.
- **Supply Chain Disruptions:** The US imports 400 different ready-for-use medications from Canada, with 28 having no alternative supplier.
  - Tariffs could exacerbate existing drug shortages, particularly for essential medicines.

Decline of WTO

- **US Withdrawal from WTO Funding:** The Trump administration halted US contributions to the WTO, further weakening its influence.
  - The WTO's dispute resolution mechanism has been paralyzed due to blocked judicial appointments.
- **Rise of Protectionism:** The US has imposed reciprocal tariffs on trading partners, undermining WTO principles of free trade.
  - China and other nations have retaliated, escalating global trade tensions.
- **Future of Global Trade:** Experts argue that the WTO is no longer fit for purpose and requires a complete conceptual rethink.
  - The shift toward bilateral trade agreements may replace multilateral frameworks like the WTO.

Magnetic Flip-Flop: Earth's Ever-Changing Magnetic Field

Context

- From setting up observatories and satellites to analysing ship logs and archeological surveys, scientists are piecing together Earth's magnetic field past to uncover clues about future shifts.

What is a Magnetic Flip-Flop?

- A magnetic flip-flop, or geomagnetic reversal, occurs when the Earth's magnetic poles reverse their positions.
  - These events are part of the natural variability of the Earth's magnetic field.
- **Frequency**: On average, geomagnetic reversals occur every 300,000 to 500,000 years, though the intervals are irregular.
  - The last reversal, known as the **Brunhes-Matuyama reversal,** occurred approximately 780,000 years ago.

Causes and Mechanisms

- **Core Dynamics:** The Earth's magnetic field is generated by the geodynamo—the movement of molten iron and nickel in the outer core.
  - Changes in the flow patterns of this molten material can disrupt the magnetic field, leading to a reversal.

- **Role of Anomalies:** Regions like the South Atlantic Anomaly, where the magnetic field is weaker, may provide clues about the processes leading to reversals.

Implications of Magnetic Flip-Flops

- **Impact on Life:** While geomagnetic reversals do not directly harm life, they can weaken the magnetic field temporarily, increasing exposure to solar and cosmic radiation.
  - It could affect migratory species that rely on the magnetic field for navigation.
- **Technological Challenges:** A weakened magnetic field could disrupt satellite communications, GPS systems, and power grids.
- **Scientific Insights:** Studying past reversals helps scientists understand the Earth's core dynamics and the long-term behavior of its magnetic field.

Note: For more detailed information on **Shifting of Earth's Magnetic North Pole**, please look at the link: https://www.nextias.com/ca/current-affairs/28-01-2025/shifting-earth-magnetic-north-pole

Life in Debt: Global Crisis

Context

- From developed economies to developing nations, the burden of servicing public debt is squeezing budgets for essential sectors like health, education, and climate action.

About Public Debt (*aka* Sovereign Debt)

- Public debt refers to the total amount borrowed by a government to finance expenditures that exceed its revenue.
- It includes both domestic debt (borrowed from internal sources) and external debt (borrowed from foreign entities).
- It is a crucial financial tool that allows governments to fund infrastructure, social programs, and economic development.

Sources of Public Debt

- Governments raise debt through bonds, loans from international institutions, and bilateral agreements with other nations.
- The IMF plays a key role in supporting countries with debt management strategies.

Scale of the Crisis

- **Global Debt Levels:** By early 2025, global public debt has reached a staggering $100 trillion, according to the IMF, reaching nearly **100% of global GDP by 2030.**
  - Developing countries face external debt equivalent to 99% of their export earnings, diverting resources from critical development priorities.
- **Impact on Developing Nations:** Countries with a combined population of 3.3 billion are spending more on debt servicing than on health or education.
  - Interest payments outweigh climate investments in almost all developing countries, limiting their ability to respond to global challenges.

Key Challenges

- **Debt Servicing Costs:** Rising interest rates and a strong US dollar are increasing the cost of servicing debt, particularly for nations in distress.
- **Social and Economic Impacts:** Governments are forced to divert funds from social assistance and development programs to meet debt obligations.
  - For low-income countries, spending on interest payments is 2.3 times

higher than expenditure on social assistance.

- **Debt Sustainability:** High debt levels can lead to fiscal instability, making it difficult for governments to meet financial obligations.
  - Some countries face debt distress, requiring restructuring or external assistance.
- **Economic Impact:** Excessive borrowing can lead to higher interest rates, reducing private sector investment.
  - Governments may need to cut spending on essential services to manage debt repayments.

Proposed Solutions

- **Fiscal Consolidation:** Timely and appropriately designed fiscal adjustments can reduce debt ratios, particularly during economic expansions.
- **Debt Restructuring**: Renegotiation of loan terms can provide relief for countries in debt distress, allowing them to focus on growth-enhancing policies.
- **Global Cooperation:** Institutions like the IMF and UNCTAD emphasize the need for coordinated efforts among creditors to address the crisis.

Conclusion

- The global debt crisis is a stark reminder of the vulnerabilities in our economic systems.
- As nations struggle to balance debt servicing with development priorities, innovative solutions and international cooperation are essential to navigate this complex challenge.

African Penguin

Context

- Recently, a South African court issued a landmark ruling to protect African penguins, by establishing no-fishing zones around six key breeding colonies.

About African Penguin (Spheniscus Demersus)

- It is the **only penguin species native to Africa**, found along the coasts of Namibia and South Africa.
- It is known as the **Jackass Penguin** due to its **donkey-like bray.**

Conservation Efforts

- **Legal Protections**:
  - **IUCN Red List:** Critically Endangered
  - South Africa's Sea Birds and Seals Protection Act and the Marine Threatened or Protected Species Regulations.
- **Artificial Nests:** Conservationists have introduced artificial nests to improve breeding success, increasing egg hatching rates by 16.5% compared to natural nests.
- **Fishing Restrictions:** Experimental 'no-take zones' around breeding colonies have shown promise in safeguarding food supplies.

India Records Earliest Heatwave and Warm Nights in 2025

Context

- Goa and Maharashtra recorded **India's first heatwave of the year,** marking the **first time** a heatwave has occurred **during the winter season** as defined by the **India Meteorological Department (IMD).**

Record-Breaking Temperatures

- **February 2025:** IMD confirmed that February 2025 was the hottest February in 125 years.
  - Mumbai recorded 38.7°C on February 26, nearly 6°C above normal.

- **March 2025:** Odisha's Boudh district recorded the highest temperature of 43.6°C on March 16.
    - Jharsuguda and Bolangir experienced extreme heat, with temperatures reaching 42°C and 41.7°C, respectively.

Warm Nights and Their Impact

- **Nighttime Temperature Anomalies:** Between February 11 and 23, 31 states and union territories reported nighttime temperatures at least 1°C above normal.
    - In Odisha, nighttime temperatures were 5.1°C above normal on February 12 and 20.
- **Health and Agricultural Risks:** Prolonged exposure to high temperatures can exacerbate heat stress, increase mortality rates, and reduce agricultural productivity.
    - Warm nights disrupt sleep cycles and pose serious health risks, particularly for vulnerable populations.

Implications of Climate Change

- **Anthropogenic Factors:** Experts attribute the early heatwave and warm nights to anthropogenic climate change, emphasizing the need for urgent action.
- **Future Outlook:** The increasing frequency of extreme heat events highlights the importance of adaptive measures to mitigate their impact on health, agriculture, and infrastructure.

Gandhi Sagar Wildlife Sanctuary

Context

- As part of its efforts to prepare the Gandhi Sagar Wildlife Sanctuary for the introduction of cheetahs by the end of 2025, the Madhya Pradesh forest department has translocated 17 of the 24 leopards in the sanctuary.

About the Gandhi Sagar Wildlife Sanctuary

- It was established in 1974, located at the districts of Mandsaur and Neemuch of Madhya Pradesh, and is **divided by Chambal River**.
- It is part of the **Khathiar-Gir dry deciduous forests ecoregion**, characterized by a mix of dry, deciduous trees and grasslands.
    - Prominent tree species include Khair, Salai, Kardhai, Dhawda, Tendu, and Palash.
- It is home to diverse wildlife, including chinkara (Indian gazelle), nilgai, sambar, Indian leopard, langur, Indian wild dog, peacock, otter, and mugger crocodile.
    - The sanctuary is designated as an **Important Bird and Biodiversity Area (IBA),** attracting birdwatchers and conservationists.

Cultural and Historical Importance

- **Prehistoric Rock Art:** The Chaturbhuj Nala rock shelters feature prehistoric cave paintings depicting early human life, including hunting scenes.
- **Architectural Marvels:** The sanctuary houses sites of archaeological and religious significance, such as the Chaturbhujnath Temple, Hinglajgarh Fort, and Taxakeshwar Temple.

Cheetah Reintroduction Project

- **Second Cheetah Habitat:** Gandhi Sagar Wildlife Sanctuary is set to become I**ndia's second cheetah habitat**, following the success of the **Kuno National Park.**
    - The **sanctuary's open savanna-like habitat** and managed prey base make it ideal for cheetah conservation.
- **Conservation Efforts:** Measures include introducing herbivores like spotted deer

and nilgai to maintain a sufficient food supply.
    - Predator density is actively controlled to ensure the survival of cheetahs.

Mystery Illness in Chhattisgarh's Insurgency-Hit District

Context

- A remote village in **Sukma, Chhattisgarh**, is grappling with fear and uncertainty as a **mysterious illness** has claimed multiple lives within a month.

Key Symptoms and Impact

- **Reported Symptoms:** Victims experienced chest pain and persistent coughing before succumbing to the illness.
    - Nearly every household in the affected village has reported similar symptoms, causing widespread panic.
- **Fatalities:** While local sources claim 13 deaths, the administration has confirmed five recent fatalities, with the causes of two still under investigation.

Possible Causes

- **Environmental Factors:** Health officials suspect that weather changes during the mahua harvest season may be contributing to dehydration and illness.
    - Villagers spend long hours in forests collecting mahua, which may exacerbate health risks.
- **Delayed Response:** The remote location of the village delayed the arrival of medical teams, complicating efforts to identify and address the illness.

Government and Health Department Actions

- **Immediate Measures:** Medical teams have been dispatched to conduct door-to-door surveys and distribute oral rehydration solutions (ORS).
    - Blood and urine samples have been collected for testing to determine the cause of the illness.
- **Community Engagement:** Villagers have been urged to report symptoms early and avoid prolonged exposure to harsh conditions during mahua collection.

Oilfield (Regulatory and Development) Amendment Bill, 2024

Context

- Recently, the Union government has enacted the Oilfield (Regulatory and Development) Amendment Bill, 2024, marking a significant step in reforming the oil and gas sector.

Key Amendments and Provisions

- **Expanded Definition of Mineral Oils:** The bill broadens the definition of mineral oils to include coal bed methane, shale gas, and shale oil, ensuring comprehensive regulation.
    - It clarifies that coal, lignite, and helium are excluded from this definition.
- **Introduction of Petroleum Leases:** The term 'mining leases' has been replaced with 'petroleum leases', governing exploration, production, and disposal activities.
    - Existing mining leases issued under the 1948 Act remain valid and unchanged.
- **Environmental and Operational Efficiency:** The bill streamlines environmental and land clearances, addressing delays in oil and gas projects.

- It mandates Carbon Capture, Utilization, and Storage (CCUS) technologies to mitigate environmental impact.

- **Strengthening Government Oversight:** The Central Government gains greater rule-making powers, including:
  - Merging petroleum leases for operational efficiency.
  - Sharing infrastructure facilities among leaseholders.
  - Enforcing environmental obligations to reduce emissions.
- **Alternative Dispute Resolution Mechanisms**: The bill introduces alternative dispute resolution, allowing conflicts to be settled within India or internationally.
- **Revised Penalties and Compliance Measures:** The bill replaces imprisonment with financial penalties, increasing the maximum fine to ₹25 lakh.
  - Violations such as unauthorized exploration or non-payment of royalties can incur additional fines of up to ₹10 lakh per day.

Impact on India's Energy Sector

- **Boosting Domestic Production:** India currently imports 85% of its crude oil and 50% of its natural gas.
  - The bill aims to attract private investment and strengthen domestic production to reduce reliance on imports.
- **Encouraging Sustainable Practices:** By integrating CCUS technologies, the bill aligns with India's climate goals, promoting cleaner energy solutions.
- **Enhancing Regulatory Efficiency:** The amendments provide clarity and flexibility in oilfield operations, ensuring smoother project execution.

Arun Parivar Authority Bill, 2025

Context

- Recently, Arunachal Pradesh introduced the Arun Parivar Authority Bill, 2025, which seeks to establish a legal framework for good governance in the state.

About the Bill

- It establishes a family-based identification system to enhance efficiency, transparency, and accessibility in welfare schemes.

Key Features of the Bill

- **Creation of the Arunachal Pradesh Arun Parivar Patra Authority:** A dedicated authority will oversee the implementation and management of the Arun Parivar Patra (APP) ID system.
  - The authority will ensure compliance with legal frameworks and address operational challenges.
- **Introduction of the Arun Parivar Patra (APP) ID:** The APP ID is a unique identifier assigned to each family unit in the state.
  - It consolidates citizen data at the family level, making it easier to target welfare schemes and services.
  - The system aims to reduce duplication and leakages in welfare distribution.
- **Application and Enrollment Process:** Residents can apply for the APP ID online or at **Common Service Centres (CSCs)** using Aadhaar, proof of residence, and basic family details.
  - Awareness campaigns will be conducted to encourage enrollment, particularly in rural areas.
- **Data Security and Legal Safeguards:** The Arun Parivar Patra Resident Data Repository will be protected through strong encryption and legal safeguards.

- Penalties will be imposed for unauthorized use, false information, and corporate offenses.

Expected Benefits

- **Improved Welfare Distribution:** The APP ID system will streamline benefit transfers, ensuring that public welfare schemes reach the right beneficiaries efficiently.
- **Enhanced Transparency:** By consolidating family information under a single ID, the bill aims to eliminate fraud and misallocation of resources.
- **Administrative Efficiency:** The centralized database will help the government track welfare distribution and improve service delivery.

Industrial Promotion Policy 2025: Madhya Pradesh

Context

- The Madhya Pradesh government approved the Industrial Promotion Policy 2025 for sustainable industrial growth in the state.

Key Objectives of Industrial Promotion Policy 2025

- **Economic Growth Targets:** The state aims to become a **$2 trillion economy by 2047,** with a projected Gross State Domestic Product (GSDP) of **$305 billion by 2028-29.**
  - Industries' contribution to the state's GDP is expected to rise from ₹2.9 lakh crore in FY 2023-24 to ₹5.4-5.9 lakh crore by 2028-29.
- **Infrastructure Development:** The policy emphasizes the creation of world-class industrial infrastructure, ensuring a holistic ecosystem for investors and ancillary industries.
  - Sector-specific industrial parks will be developed to support emerging industries.
- **Employment Generation:** The policy aims to create 20 lakh new job opportunities over the next five years, with a focus on employment-intensive sectors.
  - Special incentives will be provided to industries employing women, reinforcing gender inclusivity in the workforce.

Investor-Friendly Measures

- **Ease of Doing Business:** The state has introduced 18 new policies to streamline approvals and reduce compliance burdens.
  - A Single Window System will expedite clearances, ensuring a seamless investment climate.
- **Financial Incentives:** Investment incentives have been increased to ₹200 crore, with MSME promotion benefits raised to ₹83 crore.
  - Direct Benefit Transfer (DBT) incentives totaling ₹1777 crore will support over 2500 industrial entities.
- **Sectoral Focus:** The policy prioritizes automobiles, textiles, renewable energy, IT, and MSMEs, aligning with India's Make in India initiative.
  - Madhya Pradesh has become the first state to implement the Global Capability Center (GCC) policy, attracting international investments.

Taj Trapezium Zone

Context

- Hearing a case on the unauthorised felling of trees in the Taj Trapezium Zone, Agra, the Supreme Court has ordered a tree census in the area.

About the Taj Trapezium Zone (TTZ)

- It is a designated area of 10,400 square kilometers surrounding the **Taj Mahal, Agra Fort, and Fatehpur Sikri,** spanning parts of Uttar Pradesh and Rajasthan.
- It is established to safeguard above **UNESCO World Heritage Sites** from environmental degradation.

Purpose and Formation

- **Environmental Protection:** TTZ was created in response to concerns over pollution damaging the Taj Mahal's pristine white marble.
  - The Supreme Court of India issued a **landmark ruling in 1996**, banning the use of coal and coke in industries within TTZ and mandating a switch to cleaner energy sources.
- **Pollution Control Authority:** The **Taj Trapezium Zone Pollution (Prevention and Control) Authority** was established under the **Environment (Protection) Act, 1986,** to oversee pollution control measures.

Challenges and Recent Developments

- **Tree Felling and Deforestation:** Illegal tree felling within TTZ has raised concerns about ecological damage. The Supreme Court has imposed hefty fines on violators, emphasizing the irreversible impact of deforestation.
- **Industrial Activities:** Industries within TTZ are required to comply with strict environmental regulations. Non-compliance can lead to shutdowns or relocation.
- **Agroforestry Exemptions:** The Supreme Court recently withdrew exemptions for agroforestry activities, citing a lack of clarity and potential misuse.

Significance of TTZ

- **Preserving Heritage:** TTZ plays a crucial role in protecting the Taj Mahal and other monuments from pollution and environmental damage.
- **Ecological Balance:** The zone's regulations aim to maintain ecological balance, ensuring sustainable development in the region.

Asiatic Lion

Context

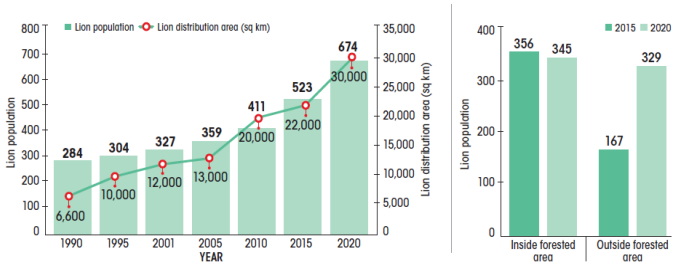
- As Asiatic lions outgrow their last refuge in Gujarat's Gir forests, they are crossing the state borders and even venturing into unlikely coastal areas to establish new territories.

About the Asiatic Lion *(Panthera Leo Persica)*

- Historically, the Asiatic lion's range **extended from the Mediterranean to the Indian subcontinent.**
- Today, their sole natural habitat is the **Gir National Park and surrounding areas** in **Gujarat's Saurashtra region.**
- Efforts have expanded their territory to **Girnar, Mitiyala, and Pania sanctuaries**, as well as community forests in **Amreli, Bhavnagar, and Junagadh districts.**

Growth beyond boundaries

The number of Asiatic lions has quadrupled since Gir National Park was established in 1965. Over the past decade, this growth is primarily concentrated in areas outside the forests. Lion numbers have in fact reduced inside forested areas



Physical Characteristics

- Compared to their African counterparts, Asiatic lions are slightly smaller and more compact. Distinguishing features include:

- A shorter, darker mane, exposing the ears.
- Longer tail tufts and a more prominent abdominal fold.
- Males weigh around 160–190 kg, females 110–120 kg.

- Their distinct evolutionary path over thousands of years has resulted in low genetic diversity, which poses long-term survival risks.

Conservation Status

- **IUCN Red List:** Endangered
  - In the 1990s, the IUCN categorised Asiatic Lion as 'Critically Endangered' on its Red List of Threatened Species.
- **Conservation Initiatives:**
  - **Project Lion:** Launched in 2020 under the Ministry of Environment, Forests and Climate Change (MoEFCC), Project Lion aims at:
    - Habitat improvement
    - Modernizing disease management
    - Translocation and population dispersion
    - Community participation
  - **Breeding & Rescue Centres:** The Sakkarbaug Zoo in Junagadh has played a pivotal role in captive breeding.
  - **Relocation Plans:** To reduce the threat of epidemics or natural disasters wiping out the population, the Kuno-Palpur Wildlife Sanctuary in Madhya Pradesh was proposed as an alternative site.

Challenges to Survival

- **Single Population Vulnerability:** Any disease outbreak (e.g., the CDV outbreak in 2018) could be catastrophic.
- **Human-Wildlife Conflict:** Expansion into revenue lands increases encounters with humans, leading to retaliatory killings or road and rail accidents.
- **Inbreeding and Genetic Bottleneck:** Limited genetic pool reduces disease resistance and adaptability.
- **Delayed Translocation:** Political resistance and administrative hurdles have blocked much-needed geographical expansion.

Silicosis

Context

- Millions of Indians work in dusty mines, factories and construction sites, facing a deadly yet underreported lung disease called silicosis.

About the Silicosis

- It is an occupational hazard debilitating and incurable lung disease caused by prolonged exposure to silica dust.
- It primarily affects workers in industries such as mining, construction, and stone-cutting, where silica particles are prevalent.

Causes and Types of Silicosis

- **Causes:** Silicosis occurs when workers inhale fine crystalline silica particles, which settle in the lungs and cause inflammation and scarring.
  - Common sources include sand, quartz, and other mineral ores used in construction and manufacturing.
- **Types:**
  - **Chronic Silicosis:** Develops after long-term exposure (10+ years) to low levels of silica dust.
  - **Accelerated Silicosis:** Occurs within 5–10 years of high-level exposure.
  - **Acute Silicosis:** Results from intense exposure over a short period, leading to rapid lung damage.

Symptoms and Health Impacts

- **Early Symptoms:**
  - Persistent cough and shortness of breath.
  - Fatigue and chest pain.
- **Advanced Symptoms:**
  - Severe respiratory distress and weight loss.
  - Increased risk of tuberculosis, lung cancer, and chronic obstructive pulmonary disease (COPD).

Prevention and Workplace Safety

- **Protective Measures:** Use of personal protective equipment (PPE) such as masks and respirators.
  - Installation of dust suppression systems and proper ventilation in workplaces.
- **Regulatory Framework:** Governments and organizations must enforce strict compliance with occupational safety standards.
  - Regular health screenings and awareness programs can help in early detection and prevention.

Global and Local Context

- **Global Impact:** Silicosis affects millions of workers worldwide, with developing countries bearing the brunt due to lax regulations.
- **India's Scenario:** In India, silicosis is prevalent among workers in mining and stone-cutting industries.
  - States like Rajasthan and Gujarat have reported high incidences, prompting calls for stronger enforcement of safety norms.

Askot-Arakot Abhiyan

Context

- The decade between 2014 and 2024 saw the most drastic changes in regions along the route of the Askot-Arakot Abhiyan.
- In 2024, the participants visited 350 villages in 45 days under the Askot-Arakot Abhiyan.

About the Askot-Arakot Abhiyan

- **Origins**: The Abhiyan was inspired by the **vision of Sundarlal Bahuguna,** a prominent environmentalist, who encouraged young minds to explore Uttarakhand's hinterlands and connect with its communities.
- The **first march** began on **May 25, 1974,** from Pangu village near the Nepal border and concluded at **Arakot village in Uttarkashi**, near the Himachal Pradesh border.

Themes Over Decades

- Each decade, the Abhiyan adopts a central theme to guide its exploration.
- The 2024 edition focused on 'source to confluence', exploring the relationship between communities and rivers.

Journey and Objectives

- **Route and Distance:** The march spans over 1,000 kilometers, covering remote villages, forests, and valleys.
  - Participants interact with local communities to understand their challenges and document changes in education, healthcare, natural resource use, and socio-political conditions.
- **Key Observations:** The Abhiyan has highlighted issues such as deforestation, migration, and the impact of development projects on traditional livelihoods.
  - It examines the role of grassroots movements **like Chipko and Himalaya Bachao** in shaping the region's environmental consciousness.

Significance and Impact

- **Community Engagement:** The Abhiyan fosters dialogue between participants and

villagers, creating a platform for mutual learning and understanding.

- **Policy Insights:** Findings from the Abhiyan have informed discussions on sustainable development and the preservation of Uttarakhand's biodiversity.

Tissue-cultured Teak in India

Context

- Tissue-cultured teak has potential to boost India's timber cultivation and trade, but requires identifying best farm practices.

About the Tissue-Cultured Teak *(Tectona Grandis)*

- It involves the propagation of teak plants in a controlled laboratory environment using small tissue samples from superior-quality mother trees.
- The process includes explant selection, in vitro sterilization, cell multiplication, shoot and root development, and hardening of plantlets before they are transferred to natural conditions.

Advantages of Tissue-Cultured Teak

- **High-Quality Saplings:** Tissue-cultured teak plants are genetically uniform, ensuring consistent growth and superior wood quality.
- **Disease Resistance:** These saplings are free from pathogens, reducing the risk of diseases that commonly affect traditional teak plantations.
- **Faster Growth:** Tissue-cultured teak grows at an accelerated pace, allowing for earlier harvesting and higher economic returns.
- **Sustainability:** By reducing the need for natural teak forests, this method helps conserve biodiversity and mitigate deforestation.

Applications in India

- **Commercial Plantations:** Tissue-cultured teak is increasingly used in commercial plantations across states like Kerala, Tamil Nadu, and Madhya Pradesh, where it thrives in diverse soil types.
- **Afforestation Projects:** Government and private initiatives are adopting tissue-cultured teak for afforestation and reforestation programs to restore degraded lands.
- **Export Potential:** With its high-quality timber, tissue-cultured teak has significant export potential, contributing to India's economy.

Challenges and Future Prospects

- **High Initial Costs:** The tissue culture process requires advanced laboratory facilities and skilled personnel, making it cost-intensive.
- **Awareness and Adoption:** Farmers and plantation owners need greater awareness and training to adopt this technology effectively.
- **Research and Development:** Continued R&D is essential to optimize tissue culture protocols and expand its application to other tree species.

Subjective Questions

1. Do you think the global push for recycling of plastics initiatives is genuinely addressing environmental concerns, or is it merely a way to shift responsibility from corporations to consumers?
2. Considering the inherent risks in coal and lignite mining, do you believe technological advancements are sufficient to ensure safety, or should greater emphasis be placed on regulatory frameworks and worker training?

3. Considering the increasing frequency and intensity of tropical cyclones due to climate change, should global mitigation efforts focus more on strengthening disaster preparedness or on reducing greenhouse gas emissions?
4. Given the rising levels of public debt across the globe, do you believe governments should prioritize debt reduction over economic stimulus, or is deficit spending necessary for long-term growth?

MCQs

1. Consider the following energy resources:
   1. Natural Gas
   2. Renewables
   3. Nuclear

   Choose the correct option considering high to low energy mix in India:
   (a) 1-2-3
   (b) 2-1-3
   (c) 1-3-2
   (d) 2-3-1
2. Which one of the following countries was hit by a tropical cyclone *Jude* that led to flooding in major river basins?
   (a) Madagascar
   (b) Mozambique
   (c) Haiti
   (d) Mexico
3. With reference to the *'Public Debt (aka Sovereign Debt)'*, consider the following statements:
   1. It refers to the total amount borrowed by a government to finance expenditures that exceed its revenue.
   2. It includes both domestic and external debts.

   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
4. Which one of the following Indian States introduced the *'Arun Parivar Authority Bill (2025)'*, which seeks to establish a legal framework for good governance in the state?
   (a) Assam
   (b) Meghalaya
   (c) West Bengal
   (d) Arunachal Pradesh
5. With reference to the *'Gandhi Sagar Wildlife Sanctuary'*, consider the following statements:
   1. It is part of the Khathiar-Gir dry deciduous forests ecoregion.
   2. It is designated as an Important Bird and Biodiversity Area (IBA).

   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. (a), 2. (b), 3. (c) 4. (d), 5. (c)