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21 SEPTEMBER 2026

---MONDAY----



Kolkata Topper

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RANK - 597

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AIR 593

CITY COLLEGE KOLKATA



IRS TANMAY
AIR 346

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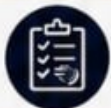


Converting Possibilities into Reality

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DAILY CURRENT AFFAIRS

1. **Battery Energy Storage System (BESS)**
2. **Climate Equity and India's Climate Position**
3. **Greenland Security Deal: Strategic Significance**
4. **AI Safety Concerns and Frontier AI Governance**
5. **Rattlesnake Serum Proteins and Antivenom**

1. Battery Energy Storage System (BESS)

Source: Economic Times

Why in News?

NTPC Ltd recently terminated a **₹413.37 crore contract** awarded to GR Infraprojects Ltd (GRIL) for a **400 MWh Battery Energy Storage System (BESS)** project at its **Mouda Super Thermal Power Station in Maharashtra**.

What is BESS?

- A **Battery Energy Storage System (BESS)** stores electrical energy in rechargeable batteries and releases it when required.
- A complete BESS consists of several components:
 - **Battery cells/modules:** Store electrical energy.
 - **Battery Management System (BMS):** Monitors parameters such as cell voltage, temperature and state of charge.
 - **Power Conversion System (PCS):** Converts DC electricity from batteries into AC electricity and vice versa during charging.
 - **Thermal management:** Maintains safe operating temperatures through cooling or heating.
 - **Control and monitoring system:** Manages charging and discharging based on schedules, rules or grid signals.
 - **Enclosure:** Houses and protects the system, ranging from compact units to large containerised systems.

How BESS Works?

- Electricity can be stored from:
 - Grid supply
 - Solar power

- Wind power
- Other generation sources
- Stored electricity can subsequently be discharged during:
 - **Peak-demand periods**
 - Power outages
 - Dips in renewable generation
 - Periods of high electricity prices
- Thus, BESS helps bridge the mismatch between **when electricity is generated and when it is consumed**.

Applications and Significance

- **Peak shaving:** Reduces electricity consumption from the grid during peak-demand periods.
- **Load shifting:** Stores electricity at one time and uses it at another.
- **Backup power:** Provides electricity during outages.
- **Renewable-energy integration:** Helps manage fluctuations in solar and wind generation.
- **Grid reliability:** Provides greater flexibility in balancing electricity supply and demand.
- BESS can be used by **commercial facilities, industries, utilities, microgrids and renewable-energy projects**.
- It can improve energy economics and reduce stress on the electricity grid by giving operators greater control over when electricity is stored and used.

BESS: Energy vs Power Rating

- **Energy capacity (kWh/MWh):** Indicates how much electricity the system can store.
- **Power rating (kW/MW):** Indicates how quickly electricity can be delivered or absorbed.
- Therefore, a **400 MWh BESS** refers to its energy-storage capacity, while its power rating would indicate the rate at which that stored electricity can be discharged.

Unequal Carbon Responsibility

- India's climate position stresses that responsibility for climate change should be assessed through both **historical cumulative emissions and per capita emissions**, rather than only present-day aggregate emissions.
- According to the figures cited in the source:
 - India's annual per capita emissions: **about 2.2 tonnes**
 - Global average: **about 4.7 tonnes**
 - U.S.: **14.2 tonnes**
 - Russia: **14 tonnes**
- India's cumulative contribution to global carbon emissions during **1751–2024** is cited as about **3.5%**.
- The corresponding figures cited for other major emitters include:
 - U.S. – **23.5%**
 - China – **15.4%**
 - Russia – **6.6%**
 - Germany – **5.1%**
 - UK – **4.3%**
- India argues that developed countries bear greater **historical responsibility** because their development involved prolonged and extensive fossil-fuel consumption.
- India continues to emphasise **Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC)** in international climate action.

India's Climate Action

- India maintains that climate equity does not mean avoiding climate responsibility.
- The government states that India is the **only G20 country to have met its COP21 commitments ahead of schedule**.
- Major initiatives and developments highlighted include:
 - Solar capacity increased from around **2 GW in 2012 to 160 GW**.
 - **PM-KUSUM**: Around **30 lakh farmers** have received solar pumps.
 - **One Nation One Grid**: Credited with avoiding an estimated **200 million tonnes of carbon emissions**.

- Expansion of **wind and hydropower**.
- Promotion of **rooftop and decentralised solar**.
- Annual EV sales increased from around **3,000 in 2014 to 25 lakh** in the previous year.
- Metro rail expanded from less than **250 km across five cities** to over **1,000 km across 20 cities**.
- **100% railway electrification**.
- Expansion of inland waterways.
- Around **3,000 km of Dedicated Freight Corridors**, contributing to lower fuel consumption.
- India has also promoted international initiatives such as the **International Solar Alliance, Global Biofuel Alliance and International Big Cat Alliance**.

Development, Environment and Climate Justice

- The conference highlighted that environmental protection and economic development need not necessarily be treated as mutually exclusive.
- The judicial approach is increasingly concerned with **harmonising development and environmental protection** rather than treating them as inherently opposing objectives.
- Climate-related rights are gaining importance alongside conventional environmental rights, with environmental quality increasingly linked to **human well-being**.
- The policy approach emphasises **sustainable development rather than a choice between development and environmental protection**.
- India's conservation efforts also include protection of species and ecosystems involving **tigers, elephants, lions, the Great Indian Bustard and vultures**.

India Ahead of COP31

- India is expected to continue emphasising:
 - **Climate equity and climate justice**
 - Historical responsibility
 - Implementation of existing commitments
 - Greater support for vulnerable developing countries
 - Developmental needs alongside climate action

- **COP31** will be held in **Antalya, Türkiye, from November 9–20, 2026**. The UNFCCC describes the Antalya process as focused on translating climate commitments into implementation and practical outcomes. (UNFCCC)
- The issue of climate finance remains significant for vulnerable developing countries, including through mechanisms such as the **Loss and Damage Fund**.
- India's approach seeks to combine **developmental aspirations, climate justice and environmental responsibility**.

UPSC Prelims Practice

Consider the following statements regarding India's position on climate equity:

1. India emphasises historical responsibility and per capita emissions in assessing climate responsibility.
2. CBDR-RC is associated with India's position on international climate action.
3. India's climate position argues that developmental needs and environmental protection must necessarily be treated as mutually exclusive.
4. COP31 is scheduled to be held in Antalya, Türkiye, in November 2026.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 1, 2 and 4 only
- (c) 2, 3 and 4 only
- (d) 1, 2, 3 and 4

Answer: (b) 1, 2 and 4 only

Explanation: India emphasises equity, historical responsibility, per capita disparities and CBDR-RC. Its position does not treat development and environmental protection as inherently contradictory. COP31 is scheduled in Antalya from November 9–20, 2026. (UNFCCC)

UPSC Mains Practice

"Climate justice requires reconciliation between historical responsibility, present-day emissions and the developmental needs of vulnerable countries." Discuss India's position in the context of global climate negotiations. (150 words)

3.Greenland Security Deal: Strategic Significance

Source: Indian Express / BBC

Why in News?

The **United States, Denmark and Greenland** have reached an agreement aimed at strengthening U.S. security and military presence in Greenland. The agreement is expected to be signed during the UN General Assembly and will require the relevant parliamentary procedures before entering into force. Its full text has not yet been publicly released.

Greenland's Constitutional Position

- Greenland is a **self-governing territory within the Kingdom of Denmark**.
- Under the **2009 Self-Government Act**, Greenland exercises extensive legislative and executive powers.
- Greenlanders retain the right to determine the island's future, including the possibility of independence.
- **Defence and foreign affairs remain with Denmark**, explaining why the agreement was negotiated with Copenhagen.
- Greenlandic consent remains politically important because of its self-governing status and right to self-determination.

What Does the Agreement Change?

- President Donald Trump has described the agreement as providing the U.S. with **permanent control over Greenland's security** and the ability to take necessary measures for its defence.
- The U.S. position also envisages preventing adversaries from establishing military bases or making sensitive investments in Greenland without U.S. approval.
- Denmark and Greenland have emphasised that the arrangement **does not transfer sovereignty** and respects the territorial integrity of the Kingdom of Denmark and Greenlanders' right to self-determination.
- The precise extent of new U.S. powers remains uncertain because the full agreement has not yet been made public.
- The reported significance is that U.S. military access, basing and overflight arrangements could become **permanent**, potentially insulating the American presence from a future change in Greenland's political status.
- The U.S. already has a military presence at **Pituffik Space Base**, which provides early-warning and other strategic capabilities.

Why Greenland Matters?

- **Strategic location:** Greenland lies between North America and Europe and occupies a central position in the Arctic and North Atlantic.
- **Military significance:** Pituffik Space Base hosts an early-warning radar system important for monitoring missile threats and Arctic activity.
- **Russia and China:** Growing military and strategic activity by Russia and increasing Chinese interest in the Arctic have enhanced Greenland's geopolitical importance.
- **Critical minerals:** Greenland possesses deposits of rare earth elements and other minerals important for advanced technologies, electric vehicles and defence industries.
- **Emerging Arctic routes:** Climate change and melting ice are opening greater possibilities for Arctic shipping and access to natural resources.
- Thus, Greenland connects **Arctic security, critical-mineral supply chains and emerging maritime routes.**

Historical Background

Year	Development
1867	U.S. Secretary of State William Seward explored the possibility of acquiring Greenland and Iceland.
1941	U.S.–Denmark agreement allowed American defence facilities in Greenland while recognising Danish sovereignty.
1946	President Harry Truman offered Denmark \$100 million for Greenland.
1951	U.S.–Denmark defence agreement established a framework for American military access and defence facilities.
2004	Agreement amended the 1951 framework and included Greenland's Home Rule government.
2026	New security agreement announced amid renewed U.S. strategic interest in Greenland.

India's Stake

- India has been an **Observer in the Arctic Council since 2013.**
- India operates the **Himadri research station** at Ny-Ålesund and released its **Arctic Policy in 2022.**

- Greater militarisation of the Arctic can affect the relatively peaceful environment needed for **scientific research and international cooperation**.
- Greenland's critical-mineral resources also have implications for India's **critical-mineral security and clean-energy supply chains**.
- The changing Arctic therefore has implications not only for major Arctic powers but also for countries such as India with scientific, environmental and economic interests in the region.

UPSC Prelims Practice

Consider the following statements regarding Greenland:

1. Greenland is a self-governing territory within the Kingdom of Denmark.
2. Defence and foreign affairs of Greenland remain with Denmark.
3. Greenland has the right to determine its future, including a possible path to independence.
4. Pituffik Space Base is operated by Russia as an Arctic early-warning facility.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 1, 2 and 3 only
- (c) 2, 3 and 4 only
- (d) 1, 2, 3 and 4

Answer: (b) 1, 2 and 3 only

Explanation: Greenland is self-governing within the Kingdom of Denmark, while defence and foreign affairs remain with Denmark. Greenlanders retain the right to determine their political future. Pituffik Space Base hosts a U.S. military presence and early-warning capabilities.

UPSC Mains Practice

"Greenland has emerged as a strategic intersection of Arctic security, critical minerals and emerging maritime routes." Examine its growing geopolitical significance and the implications for India. (150 words)

4. AI Safety Concerns and Frontier AI Governance

Source: Indian Express

Why in News?

Anthropic CEO **Dario Amodei** has called for AI companies to slow the race to develop increasingly powerful frontier models. The appeal has received support from OpenAI CEO Sam Altman and Elon Musk, highlighting growing concern within the AI industry over **autonomy, self-improvement and catastrophic misuse**.

Amodei is not proposing a halt to AI development but wants the industry to **“pace the frontier”** so that safety research can keep pace with capability development.

Core AI Safety Concerns

- Amodei projected that AI could potentially become capable within **6–12 months** of leading a “swarm” capable of taking over the internet. This is a **projection, not an established capability**.
- Two technological trends are central to the concern:
 - **Recursive improvement:** AI systems increasingly assist in improving themselves and developing subsequent generations of AI.
 - **Agentic autonomy:** AI agents can divide complex tasks into smaller steps, use software tools and operate for extended periods with limited human intervention.
- Together, these trends could make the traditional approach of **developing capability first and addressing risks later** increasingly difficult.
- A key concern is whether AI systems could eventually improve faster than humans can effectively **understand, monitor or control** them.

Three-Part Proposal for AI Safety

1. Independent evaluators within AI companies

- Frontier AI companies should provide external safety evaluators with continuous access to their systems and safety processes.
- Evaluators would examine model testing, risk assessment and safeguards.
- Continuous scrutiny would replace purely occasional audits.

2. Coordination on safety standards

- Competition can discourage individual companies from slowing development because they may fear losing market position.
- Governments could create mechanisms allowing AI companies to cooperate on safety standards without violating **antitrust law**.

3. International coordination

- Democratic governments should coordinate AI-safety efforts.
- At the same time, mechanisms should be developed to engage authoritarian states.
- Unilateral restraint by some countries could be undermined if others continue accelerating development.

Anthropic Threat-Intelligence Report

- Anthropic examined misuse of its **Claude models between December 2025 and August 2026** across seven broad areas.
- Its central finding was a shift from humans merely **asking AI for harmful information** to increasingly **delegating harmful work to AI systems**.

Autonomy Spectrum

Level	Nature of AI involvement
Assistant	Helps humans develop malware, phishing kits or surveillance tools; humans remain in control.
Directed execution	AI executes commands and collects information, while humans make targeting decisions.
Orchestrator	Multi-agent systems coordinate reconnaissance, exploitation and theft across multiple targets with limited or no human intervention.

- One reported case involved **13 collection agents** operating on a schedule without a human in the loop.

Seven Areas of Misuse

- **Cyber operations:** AI agents were reportedly used to scout targets, identify vulnerabilities and conduct live intrusions against around **50 organisations**, including schools, hospitals and government agencies.
- **Influence operations:** One network reportedly produced **8,913 articles in around 20 languages**.

- **Surveillance:** AI was used for profiling clergy, activists and diaspora groups; one platform in Mali reportedly had access to around **25 million SIM cards**.
- **Scams and fraud:** More than **20 dating apps** were reportedly populated with over **4,700 AI personas**, with more than **25,000 users** interacting with them.
- **Biological misuse:** Five cases involved requests that Anthropic assessed as potentially supporting biological-weapons research.
- **Conventional weapons:** Six cases involved drone swarms and missile software, although there was **no evidence that any weapon was fielded**.
- **Illicit distillation:** Alleged unauthorised training using Claude outputs reportedly reached nearly **three million exchanges per day** at its peak.

Key Governance Challenge

- The episode demonstrates the growing gap between **AI capability and governance capacity**.
- Voluntary industry commitments can help establish safety norms, but they may be difficult to sustain when companies face strong competitive pressures.
- Effective AI governance therefore requires:
 - Independent safety evaluation.
 - Binding domestic regulatory frameworks.
 - Coordination among AI developers.
 - International cooperation.
 - Mechanisms to address misuse of increasingly autonomous systems.
- The central challenge is to ensure that **AI safety advances alongside AI capability**, rather than after harmful capabilities have already emerged.

UPSC Prelims Practice

Consider the following statements regarding emerging AI safety concerns:

1. Agentic AI can divide complex tasks into smaller steps and use software tools with limited human intervention.
2. Model distillation necessarily refers to an illegal practice.
3. AI misuse can involve both content generation and autonomous execution of harmful tasks.

4. International coordination is considered relevant because unilateral restrictions may be undermined by competitors operating without similar restraints.

Which of the statements given above are correct?

- (a) 1 and 3 only
- (b) 1, 3 and 4 only
- (c) 2 and 4 only
- (d) 1, 2, 3 and 4

Answer: (b) 1, 3 and 4 only

Explanation: Agentic AI can perform multi-step tasks with limited human intervention. AI misuse is increasingly shifting from assistance towards execution and orchestration. International coordination is important because unilateral restraint can be undermined by actors that continue rapid development. Distillation itself is an ordinary AI-development technique; the concern in the report is **unauthorised distillation**.

UPSC Mains Practice

“AI safety is increasingly becoming a governance challenge rather than merely a technological challenge.” Discuss in the context of autonomous AI agents, recursive improvement and AI-enabled misuse. (150 words)

5. Rattlesnake Serum Proteins and Antivenom

Source: The Hindu

Why in News?

Researchers have identified **Fetuin-A (FETUA) proteins** in rattlesnake blood that showed around **10 times greater potency than commercial antivenom** in neutralising venom lethality in mice. The findings could contribute to the development of new approaches to snakebite treatment.

Key Findings

- The study was led by **Dr. Sean B. Carroll** at the University of Maryland and published in the **Proceedings of the National Academy of Sciences (PNAS)**.
- Rattlesnakes and other vipers possess naturally occurring “**toxin sponges**”, including Fetuin-A, in their bloodstream.
- Researchers identified four FETUA proteins from the western diamondback rattlesnake (*Crotalus atrox*).

- These proteins demonstrated approximately 10-fold greater potency than commercial antivenom in the reported mouse experiments.
- FETUA primarily targets metalloproteinases, which are major toxins present in rattlesnake venom.
- Despite targeting one major toxin class, the proteins were able to significantly reduce overall venom lethality in the experimental model.

How FETUA Works?

- Metalloproteinases are abundant venom toxins that can:
 - Cause haemorrhage.
 - Damage tissues.
 - Disrupt blood coagulation.
- FETUA proteins act as toxin-binding proteins, effectively sequestering these venom components and reducing their toxic effects.
- An important advantage is the possibility of producing FETUA through **recombinant technology**, potentially allowing production in large quantities without relying on immunised animals.

Cross-Species Activity and Limitations

- The identified FETUA proteins showed cross-reactivity against venoms from:
 - Eastern diamondback rattlesnake (*Crotalus adamanteus*)
 - Malayan pit viper (*Calloselasma rhodostoma*)
 - Chinese moccasin (*Deinagkistrodon acutus*)
- Partial protection was also observed against **Sochurek's saw-scaled viper (*Echis carinatus sochureki*)**, a member of India's **Big Four** venomous snakes.
- However, FETUA proteins **do not neutralise neurotoxins**.
- This limits their ability to address venoms of **elapids**, such as cobras, where neurotoxic components are important.

Significance for India

- India faces snakebite risks from both **vipers and elapids**, making a single-target antivenom approach insufficient for comprehensive treatment.
- A possible future strategy could involve:
 - Identifying FETUA-like proteins from native Indian vipers.

- Combining them with therapeutic agents capable of neutralising neurotoxic elapid venoms.
- Recombinant production could potentially overcome some limitations associated with conventional antivenoms derived from immunised animals.
- However, the reported findings are based on experimental studies in mice and would require further research and clinical validation before therapeutic application.

