DAILY CURRENT AFFAIRS 12-07-2025

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Zonal Council

Syllabus: GS-2; Federalism & Centre-State Relations

Context

- Amit Shah chairs 27th Eastern Zonal Council meeting in Ranchi, Jharkhand

About

- Zonal Councils are **advisory bodies** in India that promote cooperation and coordination between states, union territories, and the central government on matters of common interest.
- They were established under the **States Reorganization Act (1956)** to foster inter-state collaboration and reduce regional disparities.

Objectives of Zonal Councils

1. **Promote cooperation** among states and union territories.
2. **Resolve inter-state disputes** and foster harmony.
3. **Ensure balanced socio-economic development** across zones.
4. **Act as a platform** for discussing common issues like security, infrastructure, and economic planning.

Five Zonal Councils & Their Members

Each Zonal Council consists of:

- **Home Minister of India (Chairperson)**
- **Chief Ministers of member states (Vice-Chairpersons, by rotation)**
- **Other ministers & administrators** from states/UTs.

Council	States/UTs Covered	Headquarters
Northern Zonal Council	Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Delhi, Chandigarh, Ladakh	**New Delhi**
Central Zonal	Chhattisgarh, Madhya Pradesh, Uttar Pradesh,	**Allahabad**

Council	States/UTs Covered	Headquarters
Council	Uttarakhand	
Eastern Zonal Council	Bihar, Jharkhand, Odisha, West Bengal	**Kolkata**
Western Zonal Council	Goa, Gujarat, Maharashtra, Dadra & Nagar Haveli, Daman & Diu	**Mumbai**
Southern Zonal Council	Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana, Puducherry	**Chennai**

Note: The **North-Eastern Council (NEC)** is a separate entity for the 8 NE states, established in 1971.

Functions & Responsibilities

1. **Discuss and recommend** solutions on issues like:
    a. Border disputes, infrastructure, water sharing.
    b. Law & order, terrorism, disaster management.
    c. Economic and social planning.
2. **Act as a consultative body** for the central government.
3. **Review progress** of national projects in the zone.

Key Features

- **No legislative powers** (only advisory).
- **Meetings held periodically**, chaired by the Union Home Minister.
- **Decisions are recommendations**, not binding.

Significance

- Helps in **resolving inter-state conflicts** amicably.
- Ensures **coordinated development policies**.
- Strengthens **federal cooperation** in India.

Know more

Difference from Inter-State Council (ISC):

- **ISC (Article 263**) is constitutional, Zonal Councils are statutory.
- ISC is pan-India, Zonal Councils are region-specific.
- **North-Eastern Council (NEC)** is separate and has a developmental focus.

Previous Year Questions (PYQs)

1. UPSC Mains 2019: Discuss the role of Zonal Councils in promoting cooperative federalism in India.

Agricultural Monitoring and Event Detection (AMED) API

Syllabus: GS-3: Science and Technology –Artificial Intelligence.

Context:

Google announces new AI tools to strengthen India's agriculture ecosystem.

Agricultural Monitoring & Event Detection (AMED) API

Unveiled by: Google (DeepMind & Partnerships Innovation Team)

Collaborators: TerraStack, IIT-Kharagpur (under the Amplify Initiative)

What is AMED API?

An **open-source AI-based agricultural monitoring tool** designed to deliver **field-level, crop-specific insights** using **satellite data and deep learning**.

Objectives:

- Provide **real-time, granular intelligence** on agricultural activity
- Aid **agri-tech firms, financial institutions, and policymakers**
- Promote **sustainable farming, rural credit access, and climate resilience**

How It Works:

- **Remote Sensing + AI:** Monitors cropping patterns using satellite imagery
- **Field-Level Data:** Includes crop type, season, field boundaries, and **3-year land-use history**
- **Biweekly Updates:** Near real-time tracking (every 2 weeks)
- **Plug-and-Play Architecture:** Easily integrated by digital platforms and agencies

Key Features:

- **Crop Type Detection:** Identifies crop varieties seasonally
- **Historical Insights:** Tracks past 3 years of cropping patterns per field
- **Dynamic & Localized:** Enables accurate yield forecasting, rural lending, and risk assessment
- **Complementary to ALU API:** Builds upon **Google's Agricultural Landscape Understanding API** by adding event detection and crop-level depth

Significance for India:

- Boosts **data-driven agriculture and precision farming**
- Supports **climate-smart agriculture and sustainable land management**
- Enhances **financial inclusion** for farmers through risk-aware lending

HTBt Cotton

Syllabus: Science and Technology – Genetic Engineering.

Context:

In a major agricultural reform aimed at doubling cotton production in the country, the government is planning to legalise the controversial herbicide-tolerant (Ht) Bt cotton (HtBt cotton).

What is HTBt Cotton?

HTBt (Herbicide-Tolerant Bacillus thuringiensis) cotton is a genetically modified (GM) variety that combines two traits:

- **Insect Resistance**: Incorporates Bt (Cry genes) for protection against bollworm.
- **Herbicide Tolerance**: Contains CP4-EPSPS gene for glyphosate tolerance, aiding efficient weed control.

Developer: Mahyco-Monsanto Biotech (now Bayer) under the **Bollgard II Roundup Ready Flex (BG-II RRF)** platform.

Key Features

- **Dual Trait Technology**: Integrates pest resistance and herbicide tolerance.
- **Efficient Weed Management**: Enables over-the-top application of glyphosate, reducing dependency on manual labour.
- **Yield Stability**: Protects against pest and weed-related yield losses.
- **Cost Efficiency**: Reduces input costs by lowering manual weeding needs.
- **Mechanisation Friendly**: Supports large-scale mechanised farming operations.

Significance

- Addresses **labour shortages** and high **manual weeding costs**.
- Counters **yield stagnation** in Bt cotton areas due to emerging challenges like **Tobacco Streak Virus (TSV)**.
- Facilitates **regulated seed usage**, curbing illegal and substandard GM seed circulation.
- Aligns with **precision agriculture** goals and sustainability in cotton cultivation.

Polycyclic Aromatic Hydrocarbons (PAHs)

Syllabus: GS-3; Science & Technology

Context

- NASA's James Webb Space Telescope (JWST) has detected **PAH signatures in distant galaxies** and protoplanetary disks, supporting their role in cosmic chemistry. Meanwhile, environmental studies highlight **rising PAH levels from wildfires and urban pollution**, urging stricter global regulations.

1. Definition & Structure

- PAHs are **organic compounds** composed of **carbon and hydrogen**, arranged in **two or more fused aromatic (benzene) rings**.
- **Flat, ring-like structure** contributes to their stability in harsh environments.
- Found **naturally** (e.g., forest fires, volcanic eruptions) and **anthropogenically** (e.g., combustion engines, industrial processes).

2. PAHs in Space & Cosmic Significance

- **Abundance in Space:**
  - Make up **~20% of carbon** in interstellar space.
  - Detected in **Taurus Molecular Cloud 1 (TMC1, 430 light-years away)** and other molecular clouds.
- **Role in Astrochemistry & Origin of Life:**
  - May have **seeded early Earth** via meteorites, contributing to prebiotic chemistry.
  - **Survival Mechanism:** Small PAHs (e.g., indenyl cation) **cool rapidly** through **recurrent fluorescence**, avoiding radiation-induced destruction.

3. Formation & Sources

- **On Earth:**
  - **Natural:** Forest fires, volcanic activity.
  - **Human-Made:**
    - **Combustion** (vehicles, coal, wood, tobacco).
    - **Industrial emissions** (oil refining, coke production).

- **Food processing** (grilled/smoked meats).

➢ **In Space:**

- Formed in **interstellar clouds** via **gas-phase reactions** and **fragmentation of larger molecules**.

4. Health & Environmental Impact

➢ **Human Health Risks:**

- **Carcinogenic** (e.g., benzo[a]pyrene is a **Group 1 carcinogen**, linked to lung, skin, and bladder cancers).
- Respiratory diseases (asthma, bronchitis).
- Reproductive & developmental toxicity.

➢ **Environmental Effects:**

- **Persistent pollutants** in soil, water, and air.
- **Bioaccumulate** in aquatic life, entering the food chain.

5. Scientific Research & Key Discoveries

➢ **Mystery of PAHs in TMC1:**

- Small, closed-shell PAHs **should break down** under intense starlight but **persist unexpectedly**.
- **Cooling Mechanism (Recurrent Fluorescence):**
  - **Indenyl cation (C9H7+)** cools rapidly by emitting light, preventing decomposition.
  - Confirmed via **DESIREE experiments** (ion-storage rings at –260ºC).

➢ **Modelling PAH Survival:**

- Three energy-loss pathways:
  - **Dissociation** (bond breaking).
  - **Infrared emission** (vibrational cooling).
  - **Recurrent fluorescence** (light emission).
- Simulations including recurrent fluorescence **match observed PAH stability**.

6. Implications for Astrobiology & Planet Formation

➢ **PAHs as Prebiotic Molecules:**

- Could have delivered **organic carbon** to early Earth.

- **Role in Planet Formation:**
  - Contribute to **interstellar dust** and **protoplanetary disks**.
  - Recent studies suggest **PAHs aid in molecular cloud chemistry**, influencing star and planet formation.

6. Future Research Directions

- **Space Missions:** Analyzing PAHs in **comets, asteroids, and exoplanets**.
- **Bioremediation:** Using microbes to degrade PAH pollutants on Earth.
- **Advanced Detection:** Improving spectroscopic techniques for interstellar PAH mapping.

'Sudarshan Chakra' Air Defence System

Syllabus: GS-3: Science and Technology – Defence Technology.

Context:

The Ministry of Defence has identified an Indian firm to establish a maintenance repair and overhaul (MRO) facility for the S-400 air defence system in the country.

What is the S-400 'Sudarshan Chakra'?

- The **S-400 Triumf** is a long-range **surface-to-air missile (SAM)** system developed by **Russia's Almaz-Antey**.
- NATO designation: **SA-21 Growler**.
- In India, it is named **'Sudarshan Chakra'**, symbolising precision and swiftness in defence, inspired by the mythological divine weapon.

Development & Induction

- **Developer**: Almaz-Antey Air and Space Defence Corporation (Russia).
- **In Russian service**: Since 2007.
- **India-Russia Agreement**:
  - **Deal Signed**: October 2018.
  - **Cost**: ₹35,000 crore (~$5.4 billion).
  - **Units Ordered**: 5 squadrons.
  - **Deliveries**: 3 received; remaining 2 expected by **2026–2027**.

Key Features

- **Range & Detection**:
  - Detects threats up to **600 km** away.
  - Engages targets up to **400 km** depending on missile type.
- **Missile Types**: Uses four different interceptor missiles for layered defence.
- **Target Engagement**:
  - Tracks and engages **80 aerial targets simultaneously**.
  - Effective against **stealth aircraft**, **UAVs**, **cruise missiles**, and **hypersonic threats**.
- **Response Time**: Extremely fast; full launch cycle within **seconds**.
- **Missile Guidance**: Active & semi-active radar seekers.
- **System Components**:
  - Command & control vehicles
  - Long-range surveillance radar
  - Engagement radar
  - Launcher vehicles
  - Over **16 vehicles per squadron**

Deployment in India

- **Strategic Locations**:
  - **Pathankot** (Punjab)
  - **Siliguri Corridor** (Chicken's Neck in North Bengal)
  - **Western Front** (Rajasthan & Gujarat)
- **Operational Use**:
  - Played a key role in **Operation Sindoor** by **intercepting 15+ aerial threats**.

MRO Facility Development

- The **Ministry of Defence** has identified an **Indian firm** to set up a **Maintenance, Repair, and Overhaul (MRO)** facility.
- Purpose: Boost **indigenisation**, reduce **logistical dependency** on Russia, and ensure long-term **operational readiness**.

Significance for India

- **Strengthens Air Defence**: Provides **strategic deterrence** against Pakistan and China.
- **Force Multiplier**: Integrates with IAF's radar networks and missile systems.
- **Geopolitical Significance**:
  - Despite US CAATSA sanctions pressure, India prioritized **strategic autonomy** in defence procurement.
  - Enhances **self-reliance (Aatmanirbhar Bharat)** with the upcoming **MRO facility**.