DAILY CURRENT AFFAIRS
(02.03.2025)

1. President Draupadi Murmu launched the Pink National Common Mobility Card or Pink Saheli Smart Card.

- Launched during the **"Sashakt Nari, Samriddh Delhi"** event in New Delhi.
- It is based on the **National Common Mobility Card (NCMC)** framework.
- Designed specifically for **women residents of Delhi**.
- Provides **free travel in Delhi Transport Corporation (DTC) buses** for eligible women.
- Can also be used for **paid travel in Delhi Metro and other public transport systems**.
- Aims to promote **women's safety, empowerment, digital payments, and seamless mobility**.

EDITORIALS

1. Sixteenth Finance Commission: Misses and Concerns

Introduction

The editorial critically examines the recommendations of the Sixteenth Finance Commission (FC-XVI) in the context of India's fiscal federal framework. While acknowledging methodological flexibility, it raises concerns regarding declining fiscal space for States, weakening equalisation principles, and inadequate correction of structural imbalances in Centre–State financial relations.

I. Vertical Devolution (Centre–State Share of Taxes)

1. Retention of 41% Share

- The Commission retained the States' share in the divisible pool at **41%**, as recommended by the Fifteenth Finance Commission.
- However, the effective transfer to States has declined due to the increasing proportion of **cesses and surcharges**, which are excluded from the divisible pool under Article 270.

2. Rising Cesses and Surcharges

- The share of cesses and surcharges in gross tax revenue has significantly increased over successive Commissions.
- This practice reduces the actual quantum of resources devolved to States.
- The Commission did not strongly recommend structural limits on such levies, despite their implications for cooperative federalism.

3. Declining Revenue Transfers

- The proportion of gross revenue receipts transferred to States has declined compared to earlier Finance Commissions.
- The Fourteenth Finance Commission had significantly enhanced States' share to 42%, strengthening fiscal autonomy.
- In contrast, the Sixteenth Commission reflects a marginal contraction in fiscal decentralisation.
- **Analytical Concern:** Although the nominal percentage remains unchanged, the real fiscal capacity of States is weakened due to shrinking divisible resources.

II. Horizontal Devolution (Distribution Among States)

1. Change in Income Distance Methodology

- The Commission altered the method of computing "income distance."
- Instead of using a direct per capita income gap approach, it used the square of income distance relative to GSDP.
- This reduces the redistributive intensity of the formula.

Implication:

- The equalization objective — which aims to bridge fiscal capacity disparities among States — is diluted.

2. Removal of Tax Effort Criterion

- The "tax effort" parameter, which incentivised fiscal discipline and efficient revenue mobilisation, was dropped.
- This may weaken incentives for States to enhance own-tax revenues.
- **Concern:** The revised formula appears less aligned with principles of fiscal responsibility and performance-based incentives.

III. Impact on States

1. Major States Experiencing Reduction

- Several large States are projected to lose relative shares under the revised formula.

2. Reduction in Revenue Deficit Grants

- Revenue deficit grants have been curtailed.
- Devolution alone may not sufficiently compensate fiscally weaker States.

Overall Effect:

- The shift from grants to formula-based devolution may disadvantage States with structural revenue deficits.

IV. Equalization and Fiscal Needs Assessment

- Equalization grants aim to ensure comparable levels of public services across States.
- The editorial argues that the Commission did not adequately estimate normative expenditure needs in sectors such as health and education.
- While discouraging ad hoc State-specific grants is institutionally sound, the absence of robust equalization mechanisms may widen regional disparities.

V. Constitutional Perspective

- Articles 270 and 280 empower the Finance Commission to determine tax devolution objectively.
- The Commission could have more assertively addressed:
- The distortionary impact of cesses and surcharges.
- The declining effective share of States.
- The need for strengthened equalization principles.

Core Analytical Assessment

- The Sixteenth Finance Commission reflects:
  - Greater methodological flexibility,
  - Reduced emphasis on redistributive equalization
  - Limited intervention in correcting Centre's increasing reliance on non-shareable revenues.
  - While maintaining nominal devolution levels, the Commission's approach may:
  - Constrain State fiscal autonomy,
  - Weaken incentives for fiscal discipline, and
  - Potentially intensify inter-State fiscal inequalities.

Conclusion

The editorial suggests that the Sixteenth Finance Commission represents a cautious and technically refined approach but falls short in strengthening cooperative federalism and the equalisation mandate central to India's fiscal architecture. The long-term implications may include reduced fiscal space for States and a gradual weakening of decentralised financial governance.

2. Why Sustainability, Not Productivity, Is the Key to Coconut Cultivation

Context and Central Thesis

The editorial argues that India's coconut sector must transition from a productivity-driven model to a sustainability-oriented framework. In the face of climate variability, ecological stress, and ageing plantations, long-term resilience is more critical than short-term yield enhancement.

II. Status of Coconut Cultivation in India

- India is one of the world's largest producers and consumers of coconut.
- Cultivation is concentrated in:
  - Kerala
  - Tamil Nadu
  - Karnataka
  - Andhra Pradesh
  - Other coastal and peninsular regions
- The sector supports a large number of small and marginal farmers.
- The Coconut Promotion Scheme (2023–27) focuses primarily on productivity improvement through distribution of high-yielding planting materials.
- **Observation:** Current policy orientation remains production-centric.

III. Structural Challenges Facing the Sector

1. Ageing Plantations

- A significant proportion of coconut palms are old and senile.
- Productivity naturally declines with age.
- Replantation efforts remain inadequate and slow.

2. Climate Change and Environmental Stress

- Coconut cultivation is highly sensitive to:
- Temperature rise
- Irregular rainfall
- Drought episodes
- Extreme weather events
- Climate instability affects yield consistency and farm incomes.

3. Pest and Disease Vulnerability

- Increased incidence of pests and diseases under stressed ecological conditions.
- Monoculture practices heighten susceptibility.

4. Water and Soil Constraints

- Over-extraction of groundwater in certain regions.
- Declining soil fertility and organic matter content.

IV. Limitations of a Productivity-Centric Approach

- Emphasis on high-yielding varieties does not guarantee climate resilience.
- Distribution of seedlings without ecological suitability assessment may reduce survival rates.
- Productivity gains may be short-lived if environmental stress remains unaddressed.
- Increased input dependency can escalate costs and environmental degradation.
- **Analytical Insight:** Yield maximization without ecological sustainability is structurally unstable.

V. Imperatives for a Sustainability-Oriented Model

1. Development of Climate-Resilient Varieties

- Drought-tolerant and heat-resilient cultivars.
- Pest-resistant strains adapted to regional conditions.

2. Region-Specific Cultivation Strategies

- Agro-climatic zone-based planning.
- Tailored interventions for east coast, western coast, and peninsular interiors.

3. Scientific Replantation

- Systematic replacement of senile palms.
- Adoption of improved planting techniques.

4. Diversification and Agroforestry

- Intercropping with compatible crops.
- Integrated farming systems to reduce risk.
- Agroforestry models for ecological balance.

5. Sustainable Resource Management

- Micro-irrigation systems (drip irrigation).
- Rainwater harvesting.
- Soil health restoration through organic inputs.

VI. Institutional and Policy Dimensions

- Schemes must extend beyond seedling distribution.
- Greater emphasis on:
- Research and development
- Climate adaptation planning
- Farmer training and extension services
- Long-term monitoring and evaluation
- Institutional coordination is essential for integrating sustainability into policy design.

VII. Broader Economic and Social Implications

- Sustainable cultivation ensures:
- Stable farmer incomes
- Reduced climate vulnerability
- Improved export competitiveness
- Strengthened rural livelihoods
- Enhances long-term viability of the coconut economy.

Conclusion

The editorial underscores the necessity of a paradigm shift from productivity maximization to sustainability-led agricultural transformation. Without embedding climate resilience, ecological management, and region-specific planning into coconut policy, productivity gains will remain fragile and unsustainable.

3. Atmospheric Re-entry of Astronauts: Scientific Principles and Survival Mechanisms

Conceptual Overview

- Atmospheric re-entry refers to the controlled return of a spacecraft from orbital velocity into Earth's atmosphere. Unlike launch, which requires acceleration to overcome gravity, re-entry is a process of systematic deceleration involving:
  - Dissipation of kinetic energy
  - Thermal protection against extreme heating
  - Maintenance of aerodynamic stability
  - Precision guidance within a defined re-entry corridor
  - It represents one of the most technically demanding phases of human spaceflight.

II. Orbital Mechanics and Energy Considerations

1. Orbital Velocity

- Spacecraft in Low Earth Orbit (LEO) travel at approximately **7.8 km/s**.
- At this velocity, the spacecraft possesses enormous kinetic energy.

2. Energy Dissipation

- More than **98% of the spacecraft's kinetic energy** must be safely dissipated during descent.
- Energy conversion primarily occurs through:
- Atmospheric drag
- Compression heating of air molecules

III. Aerothermal Heating and Plasma Formation

1. Mechanism of Heating

- Re-entry heating is caused not merely by friction but predominantly by:
- Rapid compression of atmospheric gases ahead of the vehicle.
- This compression generates temperatures of several thousand degrees Celsius.

2. Plasma Sheath

- At extreme temperatures, air molecules ionise, forming a plasma layer.
- Plasma creates:
  - Intense thermal loads
  - Temporary communication blackout (radio signal disruption)

IV. The Re-entry Corridor

1. Definition

- A narrow permissible trajectory band within which safe re-entry must occur.

2. Trajectory Constraints

- **Steep Entry:**
  - Excessive deceleration (high G-forces)
  - Structural stress and possible burn-up
- **Shallow Entry:**
  - Insufficient atmospheric braking
  - Risk of "skip re-entry" (vehicle bouncing back into space)
- Precise guidance systems ensure adherence to this corridor.

V. Thermal Protection Systems (TPS)

1. Functional Requirement

- Protect the crew module from extreme external temperatures.

2. Types

- **Ablative Heat Shields** (commonly used in crew capsules):
- Material chars and erodes in a controlled manner.
- Absorbs and carries away thermal energy.
- **Reinforced Thermal Tiles** (used in reusable vehicles).

3. Structural Role

- Prevents internal temperature escalation.
- Maintains pressure integrity of the crew module.

VI. Aerodynamic Stability and Guidance

1. Capsule Design

- Blunt-body configuration:
- Maximises drag.
- Creates a detached shock wave to reduce heat transfer to the structure.

2. Attitude Control

- Reaction Control System (RCS) thrusters maintain proper orientation.
- Adjust lift-to-drag ratio for targeted landing.

3. Autonomous Systems

- During communication blackout, onboard computers manage trajectory corrections.

VII. Deceleration Phases

- **Phase 1: Hypersonic Deceleration**
  - Maximum heating and plasma formation occur.
  - Speed reduces significantly due to atmospheric drag.
- **Phase 2: Supersonic and Subsonic Descent**
  - Once velocity reduces sufficiently:
  - Drogue parachutes are deployed.
  - Followed by main parachutes for further deceleration.
- **Phase 3: Terminal Descent**
  - Controlled splashdown (sea landing) or ground landing.
  - Recovery teams retrieve crew and module.

VIII. Human Survival Considerations

1. G-Forces

- Astronauts experience intense deceleration forces.
- Crew seats are ergonomically designed to distribute loads safely.

2. Life Support Integrity

- Cabin pressure and oxygen levels maintained.
- Heat shield prevents thermal breach.

IX. Application to Contemporary Missions

- Modern crew modules (e.g., capsule-based systems used globally) follow a sequence:
- Service module separation
- Heat shield-forward orientation
- Controlled re-entry within corridor
- Parachute-assisted descent
- Designated recovery operations
- This approach enhances safety and reliability for human missions.

X. Scientific Disciplines Involved

- Orbital Mechanics
- Fluid Dynamics
- Thermodynamics
- Plasma Physics
- Materials Science
- Control Systems Engineering

Conclusion

Atmospheric re-entry is a carefully engineered process involving controlled aerodynamic braking, advanced thermal protection, precision navigation, and staged deceleration. Survival depends on maintaining structural integrity under extreme thermal and mechanical stresses while ensuring adherence to the re-entry corridor. Technological advancements in materials science, computational modelling, and spacecraft design have transformed re-entry into a repeatable and increasingly safe operation in modern human spaceflight.