PrepAlpine

The Next-Generation UPSC Institution

Where Research Meets Mentorship & Precision

Preparation Meets Precision

A Next-Generation Learning Institution

Disclaimer

The information contained in this book has been prepared solely for educational purposes. While every effort has been made to ensure accuracy, PrepAlpine makes no representations or warranties of any kind and accepts no liability for any errors or omissions. The use of any content is solely at the reader's discretion and risk.

First Edition: January 2026

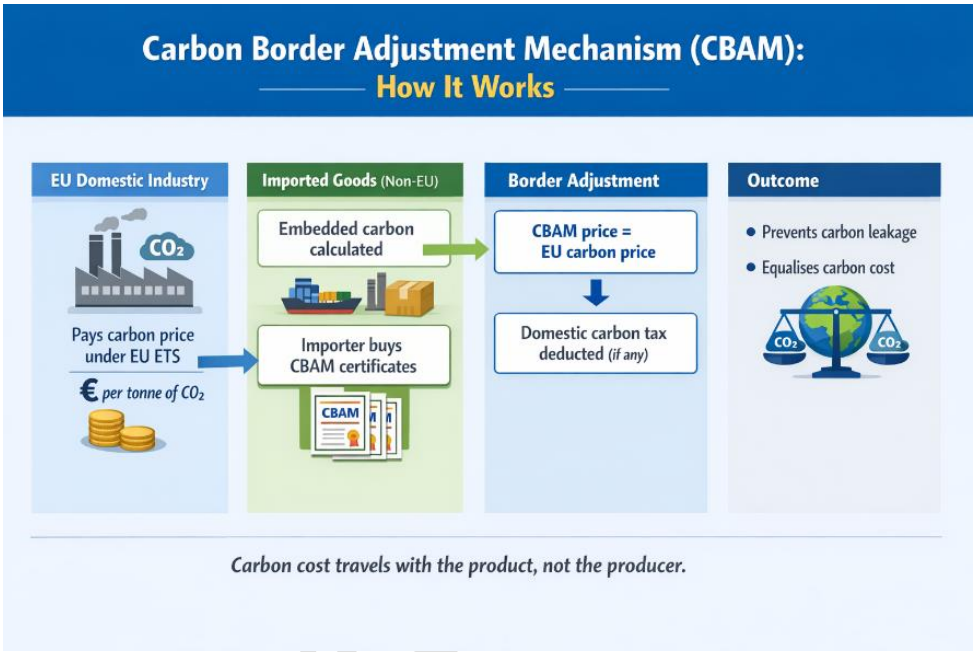
Printed and published by PrepAlpine

DAILY CURRENT AFFAIRS DATED 02.01.2026

GS Paper III: Economics

1. Carbon Border Adjustment Mechanism (CBAM): Concept, Rationale and Implications for India

a. Introduction



Global economic governance is undergoing a fundamental shift as climate concerns increasingly shape trade rules. One of the most prominent manifestations of this shift is the Carbon Border Adjustment Mechanism (CBAM) introduced by the European Union. Under this framework, access to markets is no longer determined only by price competitiveness and product quality, but also by the carbon emissions embedded in production processes.

For a developing economy such as India, CBAM raises complex questions relating to export competitiveness, industrial policy, climate equity and developmental space. It is therefore important to understand CBAM not merely as a European policy instrument, but as a new trade–climate paradigm with long-term implications for global economic relations.

b. Understanding the Carbon Border Adjustment Mechanism

The Carbon Border Adjustment Mechanism is a carbon-linked charge on imports imposed by the European Union on selected goods originating from countries that do not have an equivalent carbon pricing system.

i. Core Idea of Parity

- Industries within the European Union are required to pay for their carbon emissions under the EU Emissions Trading System (EU ETS), which assigns a price to every tonne of carbon dioxide emitted.
- CBAM seeks to extend this carbon cost to imported goods so that foreign producers do not enjoy a cost advantage merely because their domestic environmental regulations are weaker.

ii. Addressing Carbon Leakage

- CBAM is designed to tackle the problem of carbon leakage, where production shifts to countries with lax climate regulations.
- Such relocation does not reduce global emissions; it only changes their geographical location.

c. Operational Logic of CBAM

CBAM functions through a system of carbon accounting and price adjustment applied at the border.

i. Carbon Measurement and Pricing

- The European Union estimates the amount of carbon emissions embedded in imported goods.
- Importers must purchase CBAM certificates corresponding to these emissions.
- The price of these certificates is linked to the prevailing carbon price in the EU market, which has hovered around €80 per tonne of CO_2 in recent years.

ii. Treatment of Domestic Carbon Pricing

- If the exporting country has an equivalent domestic carbon tax or pricing mechanism, CBAM liability can be reduced.
- Since India currently does not have a nationwide carbon pricing regime, Indian exports are exposed to the full CBAM charge.

d. Sectoral Coverage of CBAM

CBAM has initially been applied to sectors that are both energy-intensive and carbon-intensive, with scope for future expansion.

i. Covered Sectors

- Steel
- Aluminium
- Cement
- Fertilisers
- Electricity
- Hydrogen

ii. Rationale for Sector Selection

- These sectors account for a large share of global industrial emissions.
- They form the backbone of infrastructure and manufacturing in emerging economies.
- In India, these sectors are closely linked to export growth and employment generation.

e. Why CBAM Matters for India

India's exposure to CBAM is significant due to its export structure.

i. Trade Exposure

- Over one-fifth of India's steel and aluminium exports are directed towards the European Union.
- These are precisely the sectors covered under CBAM.

ii. Cost and Competitiveness Impact

- Estimates suggest export realisation could decline by 15–22 per cent, depending on sector and production process.
- Exporters may be forced to absorb costs, renegotiate contracts, or exit EU markets.

iii. Impact on MSMEs

- Micro, Small and Medium Enterprises (MSMEs) lack financial capacity for rapid technological upgrades.
- They also face difficulties in meeting complex emissions reporting and verification requirements.

- CBAM may therefore disproportionately burden smaller firms.

f. Carbon Intensity of Indian Industry

The severity of CBAM's impact depends on the emission profile of production technologies.

i. Technology Pathways in Steel Production

- India largely relies on coal-based blast furnace technology, among the most carbon-intensive globally.
- In contrast, European and American producers use scrap-based electric arc furnaces, which emit significantly less carbon.

ii. Structural Disadvantage

- This technological gap gives developed countries a built-in advantage under carbon-linked trade regimes.
- Even efficient Indian producers face higher penalties due to their production pathway rather than inefficiency.

g. Compliance and Verification Challenges

CBAM requires highly granular emissions reporting.

i. Data and Verification Requirements

- Exporters must submit plant-level and product-specific emissions data.
- Emissions from direct fuel use and electricity consumption must be reported.
- Verification must be conducted by auditors accredited under European or international standards.

ii. Indian Constraints

- India faces a shortage of accredited verifiers.
- This raises compliance costs and risks procedural delays.

iii. Risk of Default Values

- In the absence of verified data, the EU applies default emission values.
- These are often much higher than actual emissions, sometimes doubling CBAM liability.

h. CBAM and the Climate Equity Debate

CBAM has reignited debates on equity in global climate governance.

i. Developed Country Perspective

- CBAM is framed as an environmental measure to prevent carbon leakage.
- It is presented as an extension of domestic climate policy, not a trade barrier.

ii. Developing Country Concerns

- CBAM is seen as undermining Common But Differentiated Responsibilities (CBDR).
- It ignores historical emissions and differing developmental capacities.
- Applying rich-country carbon prices to developing-country exports constrains development space.

i. CBAM as a Form of Green Protectionism

Beyond environmental goals, CBAM has clear economic implications.

i. Protective Effects

- It raises the cost of imported goods, shielding European industries.
- It generates additional fiscal revenue for the EU.

ii. Wider Trade Context

- When combined with existing tariffs on steel and aluminium, CBAM makes carbon-intensive sectors among the most protected globally.
- This has led to concerns that climate action is being used as a new form of protectionism.

j. Implications for India–European Union Relations

CBAM has added complexity to India–EU engagement.

i. Trade Negotiations

- India has raised CBAM concerns in ongoing Free Trade Agreement talks.
- It has sought flexibility and transitional arrangements, particularly for small firms.

ii. EU Position

- The EU maintains that CBAM is a climate regulation, not a negotiable trade concession.
- This divergence complicates both trade talks and climate diplomacy.

k. The Way Forward for India

India's response to CBAM must operate across multiple dimensions.

i. International Strategy

- Advocate for recognition of differentiated responsibilities.
- Seek transition periods and capacity-building support for developing countries.

ii. Domestic Preparedness

- Strengthen carbon measurement, reporting and verification systems.
- Accelerate adoption of cleaner industrial technologies and renewable energy.

iii. Industry-Level Action

- Invest in emissions monitoring and cleaner production.
- Factor carbon costs into long-term export contracts.
- Explore gradual development of a domestic carbon market.

Conclusion

The Carbon Border Adjustment Mechanism represents a structural change in the rules of global trade, where carbon emissions are becoming as important as cost and quality in determining competitiveness. For India, CBAM is not merely a technical trade instrument, but a challenge that intersects with industrial growth, developmental equity and climate justice.

A balanced and forward-looking response will require a careful blend of diplomacy, technological transition and institutional capacity-building, ensuring that the pursuit of global climate goals does not come at the expense of legitimate development aspirations.

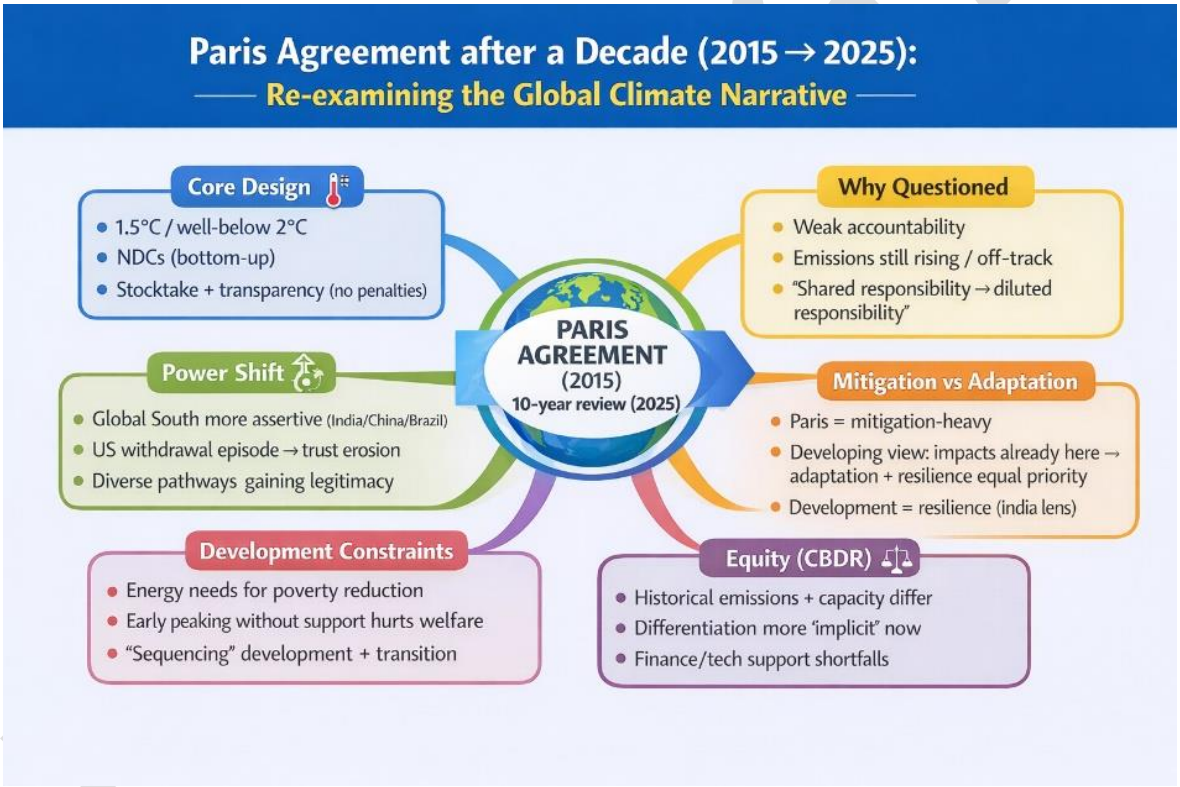
GS Paper III: Environment

2. Paris Agreement: Re-examining the Global Climate Narrative after a Decade

a. Introduction

The Paris Agreement, adopted in 2015, was widely hailed as a landmark in global climate governance. For the first time, almost all countries of the world committed themselves to a shared framework for addressing climate change. Unlike earlier treaties, the Agreement brought developed and developing countries under a single universal architecture, signalling a new phase of collective climate responsibility.

As the Agreement completes a decade by 2025, however, a deeper reassessment has begun—especially among developing countries. This re-examination does not question the scientific reality or urgency of climate change. Rather, it interrogates whether the Paris framework adequately reflects equity, development imperatives and differentiated responsibilities, or whether its strong mitigation-centric orientation has inadvertently constrained the developmental policy space of poorer nations.



b. Core Design of the Paris Agreement

i. Objectives and Temperature Goals

The central objective of the Paris Agreement is to limit the increase in global average temperature to well below 2°C, while pursuing efforts to restrict warming to 1.5°C above pre-industrial levels. This goal is rooted in scientific assessments that link higher levels of warming to exponentially severe climate impacts.

To operationalise this objective, the Agreement is built around Nationally Determined Contributions (NDCs), under which each country voluntarily sets its own emission reduction targets and climate actions based on national circumstances and priorities.

ii. A Voluntary and Cooperative Framework

A defining feature of the Paris Agreement is its bottom-up architecture.

- Emission reduction targets are not legally binding.
- There are no punitive enforcement mechanisms for non-compliance.
- Progress relies on transparency, peer pressure and periodic global stocktakes to encourage rising ambition over time.

This design was politically necessary to ensure universal participation, but it also placed heavy reliance on trust, cooperation and moral persuasion among nations.

c. Why the Paris Agreement Is Being Questioned

i. Weak Accountability Mechanisms

One of the most persistent critiques of the Paris framework relates to accountability.

- Unlike the Kyoto Protocol, which imposed legally binding emission reduction obligations on developed countries, Paris distributes responsibility across all nations without enforceable penalties.
- As a result, commitments have expanded on paper, but global emissions have continued to rise.
- The world remains significantly off track from meeting its 2030 climate targets.

When responsibility is shared broadly without enforcement, it often becomes diluted, weakening collective outcomes.

ii. Excessive Emphasis on Mitigation

The Paris Agreement is fundamentally mitigation-centric, premised on the assumption that controlling emissions is the primary pathway to averting climate catastrophe. Developing countries argue that this assumption overlooks two crucial realities.

- Climate impacts are already unfolding and cannot be fully prevented, even with aggressive emission cuts.
- Adaptation and resilience-building are equally vital, particularly for societies facing floods, droughts, heatwaves and food insecurity today.

India has articulated this perspective by emphasising that a moderate rise in temperature does not automatically imply civilisational collapse. Economic development, poverty reduction and robust infrastructure can significantly enhance a society's capacity to withstand climate shocks. In this view, development itself becomes a form of climate resilience.

d. Equity and the Question of Differentiated Responsibility

i. Common But Differentiated Responsibilities (CBDR)

The principle of Common But Differentiated Responsibilities recognises that:

- All countries share responsibility for addressing climate change.
- This responsibility is not equal, given differences in historical emissions, economic capacity and developmental needs.

Developed countries have contributed the majority of cumulative emissions and possess greater financial and technological resources. Developing countries, by contrast, have low per capita emissions and face urgent development challenges.

ii. Dilution of Equity under the Paris Framework

Under the Paris Agreement, differentiation has become more implicit than operational.

- Reporting obligations and expectations increasingly resemble a near-uniform framework.

- Financial and technological support promised to developing countries has often been delayed or fallen short.
- New instruments such as carbon border measures impose developed-country climate standards on developing-country exports.

These trends weaken the equity foundation of global climate governance and blur the moral distinction between historical responsibility and current capacity.

e. Constraints on Development Pathways

A central concern for developing countries is that the Paris framework limits choices regarding energy use, industrialisation and growth.

- Rapid poverty reduction and income growth inevitably require increased energy consumption.
- Early peaking of emissions without adequate support risks prioritising climate targets over basic human welfare.

For countries like India, climate action must be sequenced alongside development, not placed in opposition to it.

f. Shifting Power Dynamics in Climate Governance

i. A More Assertive Global South

Recent climate negotiations have witnessed a more coordinated and confident Global South.

- Countries such as India, China and Brazil have resisted rigid language on fossil fuel phase-outs.
- Greater emphasis is being placed on national circumstances and development priorities.

This marks a transition from passive acceptance to active agenda-setting by developing countries.

ii. Erosion of Traditional Leadership

The temporary withdrawal of the United States from the Paris Agreement weakened perceptions of consistent leadership.

- This undermined trust in the stability of developed-country commitments.
- It created political space for emerging economies to assert alternative perspectives.

g. Lessons from Alternative Development Pathways

China's experience offers a revealing contrast.

- Classified as a developing country, China faced no binding emission cuts for decades.
- During this period, it achieved rapid industrialisation and became the world's largest emitter.
- Simultaneously, it built the largest renewable energy capacity globally.

Only after reaching higher income and technological maturity did China commit to emission peaking and long-term net-zero goals. This suggests that development-first pathways can later enable faster and deeper decarbonisation, rather than obstruct it.

h. Reframing Climate Action around Adaptation and Resilience

An emerging school of thought argues for prioritising human resilience alongside mitigation.

- Investments in health systems, housing, sanitation, cooling access and early warning systems save lives immediately.

- Poverty reduction and social protection significantly lower climate vulnerability.

This reframing treats climate change primarily as a development challenge, where social capacity determines impact as much as atmospheric carbon concentrations.

i. Achievements of the Paris Agreement

Despite its limitations, the Paris Agreement has delivered meaningful gains.

- Climate change has been mainstreamed across national planning and global discourse.
- Renewable energy deployment has accelerated worldwide.
- Climate considerations now shape investment, industry and policy decisions.

However, the gap between ambition and outcomes remains wide, highlighting the limits of cooperation-driven governance without enforcement.

j. The Emerging Climate Narrative

The global climate discourse is increasingly moving away from uniform prescriptions.

- Greater emphasis is placed on diverse, development-sensitive pathways.
- Mitigation, adaptation and growth are being treated as complementary rather than competing goals.
- Flexibility in timelines and sovereignty over transition strategies are gaining acceptance.

This reflects a more pragmatic and politically grounded understanding of climate action.

Conclusion

Ten years after its adoption, the Paris Agreement stands at a conceptual crossroads. While it succeeded in placing climate change at the centre of global policymaking, its mitigation-heavy and cooperation-dependent design has struggled to deliver outcomes proportionate to its ambition.

The reassessment led by developing countries does not reject climate action. Instead, it calls for a framework anchored more firmly in equity, realism and development needs. The future of global climate governance is therefore likely to rest on plural, adaptive and development-aligned approaches, rather than uniform targets alone.

GS Paper III: Environment

3. Aravalli Hills and 'Strategic Exemptions': Environmental Governance at a Crossroads

a. Introduction

The debate surrounding the Aravalli Hills brings into sharp focus a deeper structural challenge in India's environmental governance. It highlights how conflicts between ecological protection, climate responsibility, and strategic or industrial imperatives are increasingly resolved not through transparent legal standards, but through loosely defined claims of "strategic interest". Such strategic exemptions, often justified in the name of national security or critical mineral needs, tend to bypass established environmental safeguards.

This approach raises fundamental concerns relating to the rule of law, environmental justice, and the long-term sustainability of development. The Aravalli case, therefore, extends far beyond a single region and offers a lens to examine how India governs its natural resources under growing economic, industrial and geopolitical pressures.

b. Ecological Significance of the Aravalli Hills

The Aravalli range is among the oldest mountain systems in the world and plays a vital ecological role across north-western India.

i. Environmental and Climatic Functions

- It supports groundwater recharge in Rajasthan, Haryana and the National Capital Region.
- It acts as a natural barrier against the eastward spread of desertification from the Thar Desert.
- It moderates local climate, improves air quality and sustains forests, scrublands and wildlife corridors.

ii. Human and Developmental Relevance

- These functions are directly linked to water security, climate resilience and habitability.
- Degradation of the Aravallis affects some of India's most densely populated and economically important regions.

c. Existing Environmental Stress in the Region

The Aravalli ecosystem is already under severe and long-standing pressure.

i. Sources of Degradation

- Decades of legal and illegal mining have scarred large tracts of land.
- Rapid urban expansion and infrastructure projects have fragmented habitats.
- Deforestation and altered drainage patterns have weakened natural recharge systems.

ii. Fragile Baseline

- Groundwater levels have declined sharply in many areas.
- Even limited regulatory relaxation risks irreversible ecological damage.

In such fragile landscapes, precaution and strict protection become more essential rather than dispensable.

d. Minerals and Strategic Considerations

i. Mineral Potential of the Aravallis

The Aravalli region is believed to contain a variety of mineral resources.

Types of Minerals

- Base metals and bulk construction materials.
- Certain minerals classified as strategically important, linked to renewable energy, advanced manufacturing and defence technologies.

ii. Strategic Rationale

From the State's perspective, mineral extraction is framed as a strategic necessity.

Security and Self-Reliance Arguments

- Heavy dependence on imported critical minerals creates supply vulnerabilities.
- Global supply chains are increasingly shaped by geopolitics and export controls.
- Domestic access is presented as essential for defence preparedness, energy transition and industrial self-reliance.

This rationale brings national security concerns into direct tension with environmental protection in ecologically sensitive landscapes.

e. Judicial and Administrative Responses

i. The Supreme Court's Position

The Supreme Court has consistently acknowledged the ecological importance of the Aravalli Hills.

Protective Interventions

- Attempts to define the extent of the Aravalli range using objective criteria.
- Restrictions on new mining activity and prohibition of mining in core or inviolate areas.
- Emphasis on sustainable mining plans.

Limited Strategic Exceptions

- Narrow exemptions have been allowed for minerals deemed critical for strategic or atomic purposes.
- These are described as strategic exemptions, intended to meet genuine national needs.

ii. Administrative Practice

Parallel to judicial oversight, executive discretion has expanded.

Use of Executive Flexibility

- Environmental clearance processes allow exemptions from public consultation for strategic projects.
- Office memoranda are used to fast-track approvals.
- Post-facto environmental clearances have become more common.

This shifts decision-making from transparent, rule-based processes to discretionary executive action.

f. The Core Problem with Strategic Exemptions

i. Absence of Clear Legal Standards

India lacks a binding legal framework to assess when strategic interests justify environmental dilution.

Legal Gaps

- No clear evidentiary thresholds or proportionality tests.
- No mandatory assessment of less harmful alternatives.
- National security is often treated as self-evident and beyond scrutiny.

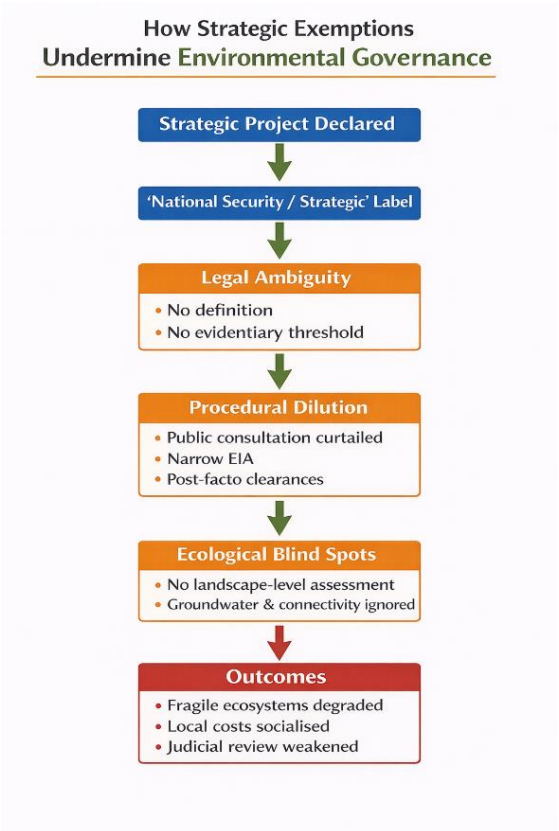
This weakens judicial review and democratic oversight.

ii. Erosion of Environmental Safeguards

Strategic exemptions often dilute core procedural protections.

Procedural Weakening

- Curtailment of public participation.
- Narrowed environmental impact assessments.
- Ignoring cumulative and long-term impacts.



This undermines principles such as the precautionary principle, intergenerational equity and the public trust doctrine.

iii. Fragmented Landscape Governance

Project-specific exemptions treat ecosystems as isolated units.

Ecological Blind Spots

- Lack of landscape-level assessment.
- Failure to account for connectivity, groundwater recharge and desertification control.

This fragmented approach does not reflect ecological reality.

g. Climate Commitments and Industrial Pressures

India faces a genuine policy dilemma.

i. Competing Imperatives

- Climate commitments require protection of ecosystems, carbon sinks and resilience.
- Industrial growth and strategic autonomy require minerals and infrastructure.

ii. Risks of Ad Hoc Resolution

- Strategic exemptions shift environmental costs onto fragile ecosystems and local communities.
- Regulatory uncertainty increases.
- Credibility of climate commitments is weakened by signalling that safeguards are negotiable.

h. National Significance of the Aravalli Case

The debate is emblematic of a broader trend in environmental governance.

Systemic Trends

- Dilution of environmental regulations in the name of strategic urgency and ease of doing business.
- Shrinking space for scientific assessment and public oversight.
- Normalisation of exceptions even in ecologically sensitive areas.

The issue is therefore about how India balances growth, security and sustainability across its landscapes.

i. Moving from Discretion to Rule-Based Governance

A sustainable resolution demands institutional reform.

i. Legal and Regulatory Reforms

- Clear legal standards to define genuine strategic necessity.
- Objective criteria subject to transparency and judicial review.

ii. Strengthening Environmental Assessment

- Mandatory landscape-level and cumulative impact assessments.
- Special focus on groundwater, climate resilience and ecological connectivity.

iii. Enhancing Transparency and Alternatives

- Public disclosure of environmental risks.
- Serious evaluation of alternatives such as recycling, import diversification and exploration in less sensitive regions.

iv. Coherent Mineral Strategy

- A long-term mineral policy aligned with ecological limits and strategic needs.

Conclusion

The Aravalli Hills debate exposes a critical fault line in India's environmental governance. While national security and mineral self-reliance are legitimate priorities, pursuing them through opaque and discretionary strategic exemptions undermines the rule of law and risks long-term ecological damage.

A credible path forward lies in rule-based, science-driven and transparent decision-making, where strategic needs are balanced against environmental protection through accountability rather than exception. Only such an approach can reconcile development imperatives with the constitutional promise of environmental protection for present and future generations.

GS Paper III: Disaster Management

4. Climate-Resilient Agriculture (CRA): Concept, Need and Roadmap for India

a. Introduction

Indian agriculture today stands at the convergence of three powerful pressures. It must continue to feed a large and growing population, sustain the livelihoods of millions of farmers, and adapt to the increasing uncertainties posed by climate change. Rising temperatures, erratic monsoon behaviour, frequent droughts and floods, declining soil health and growing water scarcity are steadily undermining the reliability of traditional farming systems.

In this context, Climate-Resilient Agriculture (CRA) has emerged not as a policy preference, but as a necessity. It represents a shift away from short-term productivity maximisation towards a long-term, resilience-oriented agricultural model, capable of absorbing climate shocks while sustaining food security, ecological stability and farmer incomes.

b. Why India Needs Climate-Resilient Agriculture

i. Structural Dependence on Climate-Sensitive Farming

A defining feature of Indian agriculture is its deep dependence on rainfall.

Rainfall Dependence

- Nearly half of India's net sown area is rainfed.
- This rainfed sector contributes a substantial share of total foodgrain production.

Even small deviations in rainfall timing, intensity or spatial distribution therefore translate into significant production volatility, making Indian agriculture among the most climate-sensitive systems globally.

ii. Rising Climate Variability

Climate change is no longer a future risk; it is a lived reality for Indian farmers.

Manifestations of Climate Stress

- Unpredictable monsoons and prolonged dry spells.
- Sudden floods and extreme rainfall events.
- Increasing frequency and intensity of heatwaves.
- Shifts in pest and disease patterns due to temperature and humidity changes.

Conventional farming practices, designed for relatively stable climatic conditions, are ill-equipped to cope with such volatility.

iii. Degradation of Natural Resources

Long-term agricultural productivity is increasingly threatened by ecological decline.

Key Resource Pressures

- Declining soil health due to excessive chemical fertiliser use and poor residue management.
- Severe groundwater depletion caused by water-intensive crops grown in unsuitable agro-climatic zones.
- Crop residue burning, contributing to air pollution and soil nutrient loss.

Without resilience-oriented reforms, these trends will erode both yields and ecosystem stability.

iv. Food Security and Farmer Livelihoods

Climate shocks directly translate into economic distress.

Livelihood Implications

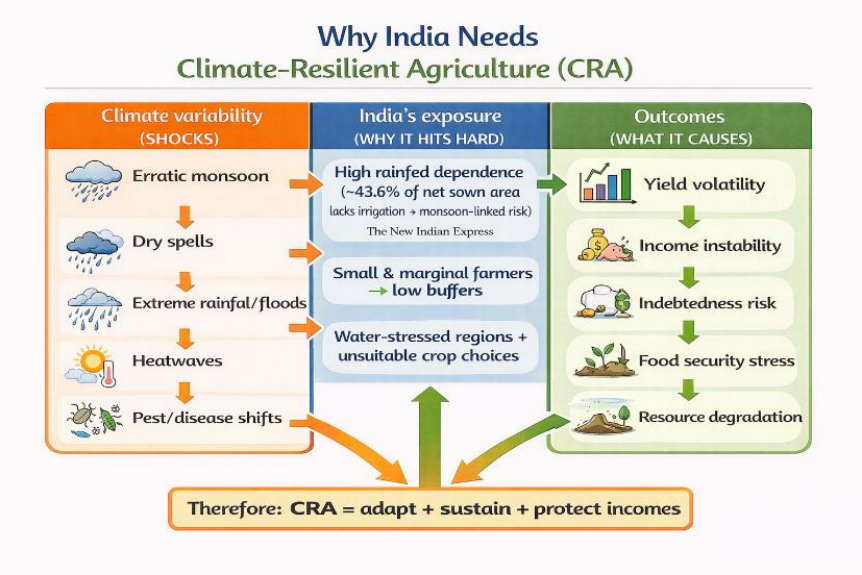
- Yield losses and income instability.
- Increased vulnerability of small and marginal farmers.
- Heightened risk of indebtedness after a single failed season.

Climate-resilient agriculture therefore serves not only environmental objectives, but also the broader goals of food security, income stability and social resilience.

c. Understanding Climate-Resilient Agriculture

i. Conceptual Meaning

Climate-resilient agriculture refers to farming systems and practices that maintain or enhance agricultural productivity while adapting to climate stress and minimising environmental harm.



Core Idea

- Strengthening the ability of crops, soils and farming systems to absorb climatic shocks.
- Ensuring long-term sustainability rather than short-term yield gains.

CRA thus integrates adaptation, sustainability and productivity into a single framework.

ii. Core Components of Climate Resilience

Climate-resilient agriculture is not a single technology, but an integrated system.

Biological and Technological Components

- Climate-tolerant crop varieties resistant to drought, heat, salinity and pests.
- Advances in biotechnology, including genome editing for stress tolerance.
- Use of biofertilisers and biopesticides to restore soil health and reduce chemical dependence.

Farm Management and Resource Efficiency

- Soil health management through residue incorporation and microbial enrichment.
- Resource-efficient practices such as zero tillage, direct seeding and improved water-use efficiency.

Digital and Data-Driven Tools

- Climate advisories and early warning systems.
- Precision irrigation and nutrient management.
- Real-time crop monitoring using artificial intelligence.

Together, these elements combine ecology, technology and farm management into a coherent resilience strategy.

d. India's Current Efforts towards Climate-Resilient Agriculture

i. Institutional Initiatives

India has taken important institutional steps towards climate resilience.

National Innovations in Climate Resilient Agriculture (NICRA)

- Launched by the Indian Council of Agricultural Research in 2011.
- Focuses on location-specific adaptation strategies.
- Implemented through climate-resilient villages across diverse agro-climatic zones.

Practices such as system of rice intensification, direct-seeded rice, zero-tillage wheat, climate-resilient crop varieties and in-situ residue management have demonstrated both ecological and economic benefits.

National Mission for Sustainable Agriculture (NMSA)

- Part of India's climate action framework.
- Emphasises rainfed area development, soil and water conservation and integrated farming systems.

ii. Biotechnology and Digital Agriculture

India's policy framework increasingly recognises the role of advanced technologies.

Biotechnology Initiatives

- The BioE3 policy identifies climate-resilient agriculture as a priority area.
- Encourages development of stress-tolerant crops and biological inputs.

Digital Agriculture and Agritech

- Agritech startups provide AI-based advisories and yield prediction models.
- Precision irrigation and input optimisation tools are being deployed.

These developments indicate strong technological potential, though adoption remains uneven.

e. Challenges in Scaling Climate-Resilient Agriculture

Despite progress, large-scale adoption faces multiple constraints.

i. Farmer-Level Constraints

- Limited awareness and financial capacity among small and marginal farmers.
- High risk aversion due to small landholdings and income insecurity.
- Quality concerns regarding biofertilisers and biopesticides.

ii. Supply and Technology Gaps

- Limited availability of climate-tolerant and genome-edited seeds.
- Regional disparities in access to improved varieties.

iii. Digital and Institutional Barriers

- Gaps in smartphone access, internet connectivity and digital literacy.
- Fragmentation of CRA initiatives across ministries and missions.

The absence of a single, integrated national roadmap reduces coherence and scale.

f. A Coherent Roadmap for Climate-Resilient Agriculture

India now requires a coordinated and forward-looking strategy.

i. Strengthening Research and Innovation

- Faster research, testing and approval of climate-tolerant and genome-edited crops.
- Stronger public–private partnerships in agricultural research.

ii. Building Trust in Sustainable Inputs

- Strict quality standards for biofertilisers and biopesticides.
- Robust supply chains to ensure reliability and farmer confidence.

iii. Expanding Digital Inclusion

- Affordable access to climate advisories and decision-support tools.
- Simple, local-language digital interfaces for farmers.

iv. Financial and Risk Management Support

- Climate-linked insurance products.
- Easier access to credit and transition incentives.

v. Integrated National Strategy

- A national climate-resilient agriculture roadmap aligning biotechnology policy, climate adaptation, agricultural reforms and digital initiatives.
- Shift from isolated pilots to systemic transformation.

Conclusion

Climate-resilient agriculture is no longer an optional reform for India; it is central to the future of food security, farmer livelihoods and climate adaptation. While India has initiated important programmes and developed significant technological capacity, the lack of an integrated and coherent strategy limits their transformative impact.

A coordinated approach that combines scientific innovation, institutional support, digital tools and farmer-centric policies can reshape Indian agriculture into a system that is productive, sustainable and resilient in the face of growing climate uncertainty.

Reader's Note — About This Current Affairs Compilation

Dear Aspirant,

This document is part of the PrepAlpine Current Affairs Series — designed to bring clarity, structure, and precision to your daily UPSC learning.

While every effort has been made to balance depth with brevity, please keep the following in mind:

1. Orientation & Purpose

This compilation is curated primarily from the UPSC Mains perspective — with emphasis on conceptual clarity, analytical depth, and interlinkages across GS papers.

However, the PrepAlpine team is simultaneously developing a dedicated Prelims-focused Current Affairs Series, designed for:

- factual coverage
- data recall
- Prelims-style MCQs
- objective pattern analysis

This Prelims Edition will be released separately as a standalone publication.

2. Content Length

Some sections may feel shorter or longer depending on topic relevance and news density.
To fit your personal preference, you may freely resize or summarize sections using any LLM tool (ChatGPT, Gemini, Claude, etc.) at your convenience.

3. Format Flexibility

The formatting combines:

- paragraphs
- lists
- tables
- visual cues

—all optimised for retention.

If you prefer a specific style (lists → paras, paras → tables, etc.), feel free to convert using any free LLM.

4. Monthly Current Affairs Release

The complete Monthly Current Affairs Module will be released soon, optimized to a compact 100–150 pages — comprehensive yet concise, exam-ready, and revision-efficient.

5. Join the PrepAlpine Discord Community

Be part of India's Smartest UPSC Peer Ecosystem → https://discord.gg/yrcDpXxv

What You'll Experience

- **Peer-to-Peer Discussions**
  Subject-wise channels for GS papers, Ethics, Economics, Polity, Geography, Environment, and Optional subjects.

- **Focused Study Circles**
  Deep-dive groups for Optionals (PSIR, Sociology, Geography, Anthropology, etc.) and critical GS themes.

- **Insight Threads**
  Collaborative micro-notes, doubt resolutions, PYQ-linked discussions, and peer-reviewed clarity.

- **Community Sessions**
  Weekly "Open Mic" sharing sessions where learners discuss strategies, mistakes, breakthroughs, and lessons from their UPSC journey.

- **An Evolving Learning Culture**
  A serious, supportive, and intelligent peer environment — no noise, no clutter. Learning grows here through interaction, reflection, and structured peer collaboration.

"From Isolation to Interaction — Learn the UPSC Way, the Smart Way."

6. Suggest Topics for Coverage

If you feel any important theme is missing or under-covered, simply post it in the "Suggestions" channel on our Discord server.

Our content team regularly reviews inputs and includes relevant suggestions in upcoming Monthly Current Affairs Modules.

Beyond daily updates, the PrepAlpine Discord functions as a complete UPSC learning ecosystem — offering free peer mentorship, structured discussions, practice threads, AI-powered micro-learning tools, and a community of serious aspirants working together.

Together, these resources embody the PrepAlpine vision:

Better Content. Smarter Mentorship. Intelligent Preparation.