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EDITORIAL ANALYSIS

The Aravalli Question — Science, Law and the Desert at the Gate

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SUBJECTS COVERED**ENVIRONMENT****GEOGRAPHY****POLITY****GS PAPERS****GS1****GS3****CURATED & WRITTEN BY****Bharat Choudhary**

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GS1

GS3



The Indian Express

MAINS RELEVANCE:

GS Paper 1

GS Paper 3



INTERVIEW ANGLE

"What should take precedence when scientific definitions and administrative convenience conflict in environmental governance?"

WHY IN NEWS

A renewed legal and scientific dispute over the geographical boundary of the Aravalli Range has come before the Supreme Court of India, as states and mining lobbies contest whether administratively drawn elevation thresholds — rather than geological and slope-based scientific criteria — should determine which lands receive legal protection from mining and construction.

THE OLDEST MOUNTAINS IN THE ROOM

The Aravalli Range has a claim that no other mountain system in India can match: it is among the oldest fold mountain ranges on Earth. Formed approximately 3.5 to 4 billion years ago during the Precambrian era — long before the Himalayas were even a geological thought — the Aravallis are the eroded remnants of what were once towering peaks. Today, they extend approximately 800 kilometres from Palanpur in Gujarat's Banaskantha district in the south to Raisina Hill in Delhi in the north — the very hill on which Rashtrapati Bhavan stands.

This geological antiquity matters not as a historical curiosity but as a conservation argument. The Aravallis are not merely old rocks. They are a living ecological system performing functions that no man-made infrastructure can replicate — functions on which hundreds of millions of people in northern India silently depend.

WHAT THE ARAVALLIS ACTUALLY DO

To understand why the definitional dispute matters, one must first understand what the range does.

Wind barrier against the Thar Desert: The Aravallis act as a natural windbreak separating the Thar Desert of Rajasthan from the Indo-Gangetic Plain. Without this barrier, the westerly winds that carry desert dust eastward would encounter no resistance. Studies by the Forest Survey of India and independent researchers have consistently shown that breaches in the Aravalli cover — through deforestation, mining, or construction — allow sand and dust to push further east, degrading air quality in Haryana, Delhi, and western Uttar Pradesh.

Groundwater recharge zones: The Aravalli foothills and ridges are critical recharge zones for the aquifers that supply water to Delhi-NCR and large parts of Haryana and Rajasthan. The fractured quartzite and schist that make up much of the Aravalli geology allow rainwater to percolate and recharge underground water tables. When these surfaces are sealed by construction or blasted open by mining, recharge capacity drops irreversibly.

Biodiversity corridor: The Aravallis form one of the few continuous wildlife corridors in the densely populated north Indian plains. Leopards, hyenas, jackals, over 200 species of birds, and numerous reptile species use the range as habitat and passage. The Sariska Tiger Reserve and the Ranthambore–Sariska corridor run along the Aravalli spine. Fragmentation of this corridor by unchecked development has already pushed leopard-human conflict to critical levels in Faridabad, Gurugram, and Alwar.

Carbon sink and “lung” for Delhi-NCR: The Aravalli ridge forests — what remains of them — provide Delhi-NCR with one of its few nearby green lungs. The Delhi Ridge, a northern spur of the Aravallis, was once a contiguous forest. Today, encroachment has reduced it to disconnected fragments.

THE DEFINITIONAL DISPUTE: 300 METRES VS GEOLOGY

Here is where the crisis originates.

In 2009, the **T.C. Benjamin Committee**, constituted by the Ministry of Environment and Forests, demarcated the Aravalli boundary using an **elevation threshold of 300 metres above mean sea level (ASL)**. The logic was administrative: elevation data is easily available, objectively measurable, and amenable to revenue map overlays.

The problem: a significant portion of the Aravalli Range — particularly in Haryana (districts of Gurugram, Faridabad, Nuh, Rewari) and parts of Rajasthan — lies below 300 metres ASL. These areas, which are geologically and ecologically part of the Aravallis by every scientific measure, were effectively excluded from the definition and, therefore, from legal protection.

The **Geological Survey of India (GSI)**, by contrast, uses slope, rock type, geological structure, and lithological continuity to define the range. Under this definition, the Aravallis include substantially more land — including the low-lying ridges and rocky outcrops that have been the targets of the most aggressive quarrying and construction.

The conflict between these two definitions is not academic. It is a multi-billion-rupee question. Real estate developers in Gurugram and Faridabad — some of the most expensive real estate markets in India — have obtained building permissions by arguing their projects fall below the 300-metre threshold and therefore outside the Aravalli zone. Marble and limestone quarry operators in Rajasthan have used the same argument.

THE SUPREME COURT'S INTERVENTIONS

The Supreme Court of India has intervened in Aravalli protection repeatedly, with mixed results.

In the **Godavarman case** (ongoing since 1995), the Court has issued numerous orders on forest conservation, some of which apply to Aravalli forest land. In specific Aravalli-related matters, the Court has at various points banned mining in Faridabad and Gurugram districts, ordered demolition of illegal construction on ridge land, and directed state governments to submit demarcation maps.

The Court's difficulty has been precisely the definitional dispute. When Haryana submits that a parcel of land is not "Aravalli" because it is below 300 metres, and the petitioner submits GSI data showing it is geologically Aravalli, the Court is placed in the position of adjudicating between competing expert frameworks — a role courts are institutionally ill-equipped to fill without clear legislative or executive guidance.

This is the crux of the current matter before the Court: should the GSI's science-based definition or the Benjamin Committee's elevation-based administrative definition govern legal protection?

ECONOMIC PRESSURE AND THE POLITICS OF DEFINITION

Rajasthan's Aravalli foothills contain some of India's richest deposits of **marble, limestone, dolomite, and quartzite** — stones that are the foundation of a billion-dollar construction materials industry. Rajasthan is the largest producer of marble in India, accounting for over 90% of national output. Much of this extraction happens in and around Kishangarh (Ajmer district), Makrana (Nagaur), and the Alwar–Bharatpur belt — all within or adjacent to the geological Aravallis.

The economic argument for a narrow definition is, therefore, not trivial. Thousands of quarry workers, truck drivers, and stone processors depend on this industry. State governments — regardless of political affiliation — face real pressure from this constituency.

But the economic calculus ignores externalities. The dust from quarrying degrades air quality. Blasting destroys groundwater recharge structures. Deforestation accelerates desertification. The costs of these externalities are borne not by the quarry owners but by farmers, urban residents, and future generations — a classic market failure that only regulation can correct.

A GOVERNANCE FRAMEWORK FAILURE

The Aravalli crisis is, at its root, a governance failure. India has no single legislation specifically protecting the Aravallis as an ecological unit — unlike, say, the Western Ghats, which has been the subject of multiple expert committees (the Gadgil Committee and Kasturirangan Committee) and a national-level ESZ (Ecologically Sensitive Zone) framework.

The Aravallis are protected only patchwork: through forest cover under the Forest Conservation Act, through wildlife habitat under the Wildlife Protection Act, and through Supreme Court orders in specific cases. This fragmentation means that a stretch of Aravalli land without forest cover, outside a wildlife sanctuary, and below 300 metres ASL is, in practice, unprotected — even if it sits on a critical groundwater recharge zone or wildlife corridor.

The solution requires legislative action. Parliament should consider a dedicated **Aravalli Protection and Conservation Act** — similar in spirit to the Coastal Regulation Zone (CRZ) Notification — that:

- Adopts the GSI geological definition as the legal boundary.

- Establishes graded protection zones (core, buffer, transition).

- Creates an inter-state Aravalli Authority (covering Rajasthan, Haryana, Gujarat, and Delhi) with enforcement powers.

- Provides for community-based conservation incentives for villages within the range.

Until that happens, the Supreme Court will continue to hold the line — a role that is necessary but not sufficient.

SCIENCE MUST LEAD GOVERNANCE

The deeper principle at stake in the Aravalli dispute is one with wide application in Indian environmental governance: when scientific evidence and administrative convenience diverge, which should govern?

The answer should be obvious, but practice has been otherwise. India has repeatedly allowed administrative and economic pressures to define environmental boundaries in ways that suit extraction — coastal regulation lines drawn to exclude resort areas, eco-sensitive zone boundaries trimmed around mining claims, forest survey methodology adjusted to reduce the total forest area that triggers legal protection.

The Aravallis are 3.5 billion years old. The economy built on their destruction is decades old. The choice between them is not a close call.

UPSC RELEVANCE

Aravalli age (~3.5–4 billion years, Precambrian), extent (~800 km, Gujarat to Delhi), states covered (Rajasthan, Haryana, Gujarat, Delhi), Raisina Hill (northernmost point), T.C. Benjamin Committee (2009), Geological Survey of India (GSI), Sariska Tiger Reserve, Forest Conservation Act, Wildlife Protection Act.

MAINS GS-1:

Geophysical phenomena, Indian geography — physiography, natural resources;

GS-3:

Environmental conservation, biodiversity, forest governance, desertification, groundwater management.

★ FACTS CORNER — KNOWLEDGE PEDIA

ARAVALLI RANGE — CORE GEOGRAPHY:

- Age: ~3.5–4 billion years (Precambrian era) — among the world’s oldest fold mountains
- Type: Eroded fold mountains (originally much higher; now deeply worn)
- Length: ~800 km (some estimates: 692 km strictly; ~800 km including spurs)
- Southern end: Palanpur, Banaskantha district, Gujarat
- Northern end: Raisina Hill, New Delhi (Rashtrapati Bhavan sits on this spur)
- States: Rajasthan (largest portion), Haryana, Gujarat, Delhi
- Highest peak: Guru Shikhar (1,722 m), Mount Abu, Rajasthan
- Rock type: Quartzite, schist, marble, dolomite, limestone (Precambrian metamorphic rocks)

ECOLOGICAL FUNCTIONS:

- Wind barrier: separates Thar Desert (west) from Indo-Gangetic Plain (east)
- Groundwater: critical recharge zone for aquifers in Delhi-NCR, Haryana, Rajasthan
- Biodiversity: leopard, hyena, jackal; ~200+ bird species; Sariska–Ranthambore corridor
- Carbon sink: Delhi Ridge (northern Aravalli spur) is one of Delhi’s few remaining green zones

THE DEFINITIONAL DISPUTE:

- T.C. Benjamin Committee (2009): used 300 metres ASL elevation threshold — excludes large Haryana and Rajasthan tracts
- Geological Survey of India (GSI): slope, geology, lithological continuity — includes more land
- Key contested areas: Gurugram, Faridabad, Nuh, Rewari (Haryana); Alwar–Bharatpur belt (Rajasthan)

ECONOMIC DIMENSION:

- Rajasthan: largest marble producer in India (~90%+ of national output)
- Key mining districts: Kishangarh (Ajmer), Makrana (Nagaur), Alwar
- Makrana marble: used in Taj Mahal; classified as white makrana dolomite

SUPREME COURT & LEGAL PROTECTIONS:

- Godavarman case (T.N. Godavarman Thirumulpad vs. Union of India, 1995): ongoing; covers forest conservation broadly
- Multiple SC orders: banned quarrying in Faridabad/Gurugram; ordered demolition of illegal construction on ridge land
- No dedicated Aravalli protection legislation exists at the national level
- Forest Conservation Act, 1980: governs forest diversion (requires Central government approval)
- Wildlife Protection Act, 1972: governs wildlife sanctuaries and national parks within Aravallis

OTHER RELEVANT FACTS:

- Sariska Tiger Reserve: located in Alwar district, Rajasthan; within the Aravalli range
- Ranthambore Tiger Reserve: eastern edge abuts Aravalli foothills; part of tiger corridor
- Thar Desert area: ~200,000 sq km — one of the world’s most densely populated deserts
- Delhi Ridge forest: originally ~30,000 acres; today fragmented remnants due to encroachment
- Western Ghats ESZ precedent: Gadgil Committee (2011) and Kasturirangan Committee (2013) — science-based ESZ demarcation; offers a model for Aravallis

CRZ Notification (Coastal Regulation Zone): graded coastal protection framework — a comparable regulatory model for Aravallis

Sources: The Indian Express, Geological Survey of India, Ministry of Environment, Forest and Climate Change

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