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A biodiversity corridor with conservation imperatives for the Aravalli Hills

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Abstract
The Aravalli Range, stretching across Gujarat, Rajasthan, Haryana, and Delhi, is one of the world's oldest mountain systems and an important ecological zone. In Rajasthan, it plays a key role in maintaining the climate, recharging groundwater, and supporting rich biodiversity. The region is home to more than 800 plant species, including 39 threatened medicinal plants. However, this ancient landscape faces threats from deforestation, mining, and urban expansion. To protect its fragile ecosystems, various national laws and conservation programs have been implemented over the years. These efforts aim to safeguard the unique flora and fauna of the Aravallis and ensure the region continues to provide essential ecological services for future generations. Preserving the Aravallis is vital for environmental stability.

Keywords: Aravalli range, biodiversity conservation, ecological services, deforestation and mining, medicinal plants

Introduction

The Aravalli Range, stretching across western India, is not only one of the oldest mountain ranges in the world but also one of the most ecologically significant landscapes in the Indian subcontinent. Extending over a distance of approximately 800 kilometers, it traverses the states of Gujarat, Rajasthan, Haryana, and reaches into the national capital territory of Delhi (Dwivedi *et al*., 2010; Sharma, 2006) [5, 13]. With an estimated age of over 2.5 billion years, the Aravallis stand as a remnant of the Earth's early geological formations, offering valuable insight into the planet's tectonic and biological history (Sharma, 2019) [15]. The Aravalli Range is among the oldest fold mountain systems, composed largely of metamorphic rocks like quartzite, schist, and gneiss. It also houses economically important minerals such as marble, granite, copper, zinc, lead, and mica. The rich mineral deposits have historically influenced the cultural and economic development of the surrounding regions, particularly in Rajasthan, where mining remains a key industry (Singh *et al*., 2015) [18]. Despite extensive mining activities leading to environmental degradation, the range continues to be recognized for its geological importance. The Aravalli Range functions as a green lung for the surrounding arid and semi-arid regions. It plays a crucial role in moderating local climate patterns, especially the monsoon cycle, by facilitating rainfall and preventing the advancement of the Thar Desert further into fertile agricultural land. This ecological barrier effect has helped sustain agriculture in the adjacent plains of Rajasthan and Gujarat (Paliwal, 2011) [11].

Additionally, the Aravallis act as an essential groundwater recharge zone. The range's rocky terrain and seasonal streams aid in maintaining underground aquifers, ensuring freshwater availability in the water-scarce regions of western India. This hydrological service is particularly critical for sustaining human settlements and agriculture in these areas (Tewari, 1991) [22].

Flora of the Aravalli Range

The Aravalli Range supports a wide variety of flora, ranging from dry deciduous forests to scrublands and grasslands, depending on the topography and rainfall patterns. Though heavily deforested in many parts, native vegetation still thrives in protected and less-disturbed zones (Singh, & Sharma, 2017) [16]. Among the common plant species are rose (*Rosa indica*), bougainvillea (*Bougainvillea spectabilis*), hibiscus (*Hibiscus rosa-sinensis*), and various types of acacia and teak. These plants support local biodiversity and are used for ornamental, medicinal, and economic purposes (Moharana, 2016) [10].

Native grasslands and shrubs serve as crucial habitats for herbivores and help retain soil, while large trees such as *Anogeissus pendula* and *Prosopis cineraria* play a role in carbon sequestration and ecosystem stability. Many of these native species have adapted to the region's high temperatures and low rainfall, making them critical for future climate-resilient vegetation planning (Singh *et al*., 2013) [20].

Protected areas of southern Aravallis and many territorial forest blocks like Kamalnath, Keora-ki-Nal, Samali, Ladan, Tinsara, Ramkunda, Har, Madri, Nal Sandol, Kirat, Raydari, Khokhariya-ki-Nal, etc. are rich in medicinal plants where besides red listed 39 species many other species also grow commonly (Sharma, 2019). Some worth recording species of this area are shown in the Table 1.

Table 1: Plant species are found in the Aravalli Range (Sharma, 2019) [15]

S. No.	Common Name	Scientific Name
1.	Hairy Miliusa	*Miliusa tomentosa*
2.	Velvetleaf	*Cissampelos pareira*
3.	Ink Berry / Jungle Rope	*Cocculus hirsutus*
4.	Indian Moonseed	*Cocculus pendulus*
5.	Giloy / Guduchi	*Tinospora cordifolia*

6.	Wild Ceylon Boxwood	*Casearia elliptica*
7.	Common Wireweed	*Sida acuta*
8.	Heartleaf Sida	*Sida cordata*
9.	Silk Cotton Tree / Semal	*Bombax ceiba*
10.	Indian Screw Tree	*Helicteres isora*
11.	Wild Jute	*Corchorus depressus*
12.	Puncture Vine / Gokhru	*Tribulus terrestris*
13.	Bael	*Aegle marmelos*
14.	Desert Date	*Balanites aegyptiaca*
15.	Neem	*Azadirachta indica*
16.	Drumstick Tree / Moringa	*Moringa oleifera*
17.	Rosary Pea / Gunja	*Abrus precatorius*
18.	Flame of the Forest / Palash	*Butea monosperma*
19.	Salparni	*Desmodium gangeticum*
20.	Velvet Bean / Kaunch	*Mucuna pruriens*
21.	Karanja Tree	*Pongamia pinnata*
22.	Golden Shower Tree / Amaltas	*Cassia fistula*
23.	Tamarind	*Tamarindus indica*
24.	Catechu Tree / Khair	*Acacia catechu*
25.	Baheda	*Terminalia bellirica*
26.	Jamun	*Syzygium cumini*
27.	Lollipop Climber	*Diplocyclos palmatus*
28.	Indian Pennywort / Gotu Kola	*Centella asiatica*
29.	Large Gardenia	*Gardenia turgida*
30.	False Daisy / Bhringraj	*Eclipta alba*
31.	Mahua	*Madhuca indica*
32.	Night Jasmine / Parijat	*Nyctanthes arbor-tristis*
33.	Conkerberry / Karonda	*Carissa spinarum*
34.	Indian Sarsaparilla / Anantmool	*Hemidesmus indicus*
35.	Indian Gentian	*Enicostemma hyssopifolium*
36.	Koda Tree	*Ehretia laevis*
37.	Shankhpushpi	*Evolvulus alsinoides*
38.	Black Nightshade	*Solanum nigrum*
39.	Ashwagandha	*Withania somnifera*
40.	Tiger’s Claw / Devil’s Claw	*Martynia annua*
41.	Malabar Nut / Vasaka	*Adhatoda zeylanica*
42.	Philippine Violet / Vajradanti	*Barleria cristata*
43.	Wild Basil	*Ocimum canum*
44.	Punarnava	*Boerhavia diffusa*
45.	Devil’s Horsewhip	*Achyranthes aspera*
46.	Bracteated Birthwort	*Aristolochia bracteolata*
47.	Indian Birthwort	*Aristolochia indica*
48.	Shiny Bush	*Peperomia pellucida*
49.	Leafless Spurge	*Euphorbia fusiformis*
50.	Mango Ginger	*Curcuma amada*
51.	Narrow-leaved Turmeric	*Curcuma angustifolia*
52.	Wild Turmeric	*Curcuma aromatica*
53.	Scentless Turmeric	*Curcuma inodora*
54.	False Mountain Turmeric	*Curcuma pseudomontana*
55.	Wild Banana	*Ensete superbum*
56.	Golden Eye-grass / Kali Musli	*Curculigo orchioides*
57.	Air Potato	*Dioscorea bulbifera*
58.	Indian Wild Yam	*Dioscorea hispida*
59.	Five-leaved Yam	*Dioscorea pentaphylla*
60.	Aloe	*Aloe vera*
61.	Shatavari	*Asparagus racemosus*
62.	Indian Asparagus	*Asparagus asiaticus*
63.	Himalayan Shatavari	*Asparagus royleanus*
64.	Loose Grass Lily	*Chlorophytum laxum*
65.	Short-stemmed Grass Lily	*Chlorophytum breviscapum*
66.	Orchid-like Grass Lily	*Chlorophytum orchidastrum*
67.	Safed Musli	*Chlorophytum tuberosum*
68.	Screw Pine	*Pandanus fascicularis*

Faunal Diversity of Aravalli Range

A 2017 survey conducted by the Wildlife Institute of India (WII) across 200 square kilometers in Haryana documented the presence of 14 mammalian species, indicating the ecological richness of the region. Among these were leopards (*Panthera pardus*), striped hyenas (*Hyaena*

hyaena), golden jackals (*Canis aureus*), nilgai (*Boselaphus tragocamelus*), wild pigs, palm civets, rhesus macaques, Indian crested porcupines, and Indian peafowls (*Pavo cristatus*), which is the national bird of India (Singh *et al*., 2014) [19].

Leopard habitats have been identified in areas such as the Ferozepur Jhirka-Nuh region, the Delhi South Ridge spanning Faridabad and Gurugram, and the Farrukhnagar area along the Delhi-Haryana border. Multiple sightings have been recorded in villages near the Kundli-Manesar-Palwal (KMP) expressway, emphasizing the necessity of formal wildlife corridors and habitat protection measures (Singh *et al*., 2014) [19].

Encouraged by these findings, the Haryana wildlife department has proposed expanded biodiversity studies, including a comprehensive wildlife census using radio-collar tracking systems. These steps aim to enhance understanding of species distribution and behavior patterns and help formulate more effective conservation policies (Jain *et al*., 2018) [7].

Eco-Sensitive Zone

The Aravalli Range, one of the oldest mountain systems in the world, has been designated as an Eco-Sensitive Zone (ESZ) by the Government of India due to its critical ecological functions and vulnerability to degradation. Stretching across Rajasthan, Gujarat, Haryana, and Delhi, the Aravallis play a vital role in maintaining environmental stability, regulating local climate, recharging groundwater, and preventing the desertification caused by the encroachment of the Thar Desert (Roy, & Purohit, 2015) [12]. In Rajasthan, where a significant portion of the range lies, the Aravalli hills are especially crucial in supporting biodiversity, agriculture, and water security (Mamtan *et al*., 2000). To safeguard this unique and fragile ecosystem, a series of legal frameworks and conservation initiatives have been introduced, particularly in response to widespread threats such as illegal mining, deforestation, and urban sprawl (Balakrishnan *et al*., 2009) [1]. The Environment (Protection) Act, 1986 empowers the central government to take necessary measures to protect and improve environmental quality and prevent ecological imbalance. Under this act, the Ministry of Environment, Forest and Climate Change (MoEFCC) issued a notification in 1992 prohibiting mining and construction activities in certain notified areas of the Aravalli hills, especially in Rajasthan and Haryana (Singh, 2013) [17].

Additionally, in 2002, the Supreme Court of India ordered a ban on all mining activities in the Aravalli region that violated environmental regulations. This was followed by the Aravalli Notification, which mandates that any project involving forest land diversion or change in land use within the Aravalli hills must receive prior environmental clearance (Kapoor & Kohli, 2012) [8]. The Forest Conservation Act, 1980, and the Wildlife Protection Act, 1972 also offer protective mechanisms for the forests and wildlife of the Aravalli region. In Rajasthan, despite the implementation of these laws, illegal mining has continued in several districts such as Alwar, Sirohi, Udaipur, and Rajsamand. To address these violations, the Rajasthan State Pollution Control Board and Forest Department have been tasked with satellite monitoring and geospatial mapping to identify encroachments and enforce compliance (Bhavan, 2000) [2]. Moreover, the National Green Tribunal (NGT) has played an active role in directing state governments to restore and reforest degraded patches of the Aravalli Range. The NGT has also emphasized the importance of declaring buffer zones and establishing eco-restoration plans for damaged areas (Sinha, 2014) [21].

The Aravalli Biodiversity Park in Gurgaon and similar projects in Rajasthan serve as models for restoring native flora and providing green urban spaces. Public interest litigations and environmental activism by civil society organizations have further pressured the government to uphold ecological norms (Chhangani *et al*., 2013) [4].

In Rajasthan, community participation through village forest committees, watershed management projects, and awareness programs has shown promising results in reforestation and water conservation efforts (Sharma & Sisodia, 2008) [14]. As climate change intensifies and urbanization spreads, conserving the Aravalli Range—especially in ecologically fragile areas like Rajasthan—is imperative. Strengthening legal enforcement, promoting afforestation with native species, and enhancing stakeholder involvement are essential to preserving this ancient natural barrier for future generations (Gurjar, & Swami, 2019) [6].

Conservation strategies in the Aravalli Range

Acts and regulations play a vital role in the conservation, assessment, and management of natural resources and biodiversity. Laws such as the Wildlife Protection Act (1972), Forest Conservation Act (1980), and Biological Diversity Act (2002) in India provide a legal framework to protect endangered species, preserve habitats, and regulate the use of forest land. These regulations help assess the conservation status of species, monitor threats, and promote sustainable practices. Conservation Assessment and Management Plans (CAMP) are guided by these laws to prioritize species for protection, ensure scientific evaluation, and involve local communities in long-term ecosystem and biodiversity conservation efforts. Therefore, forest and biodiversity conservation acts and regulations were introduced and updated from time to time some of them are shown in the Table 2.

Table 2: Acts and Regulation for Conservation

S. No.	Act and Regulations	Activities
1.	First National Forest Policy, 1952	Emphasized increasing forest cover to one-third of India's land but had weak enforcement in Aravallis.
2.	Wildlife Protection Act, 1972	Strengthened legal protection for flora and fauna; led to the creation of sanctuaries such as Sariska and Kumbhalgarh in the Aravallis.
3.	Forest Conservation Act, 1980	Restricted diversion of forest land for non-forest purposes without Central Government approval.
4.	Ban on Mining (1980s)	Supreme Court and Rajasthan government began regulating destructive mining in Aravalli hills.
5.	Chipko Movement-inspired Local Efforts	Community participation in resisting deforestation in several Aravalli foothills.
6.	Aravalli Notification (1992)	MoEFCC notification prohibited mining in notified Aravalli areas in Haryana to stop ecological

		degradation.
7.	Eco-development Programs	Launched under World Bank and MoEF funding for Sariska and other reserves to support buffer zone conservation.
8.	Watershed Development Projects	Initiated for soil and water conservation in degraded Aravalli hills using participatory planning.
9.	Supreme Court Interventions (2002–2018)	SC-mandated bans on illegal mining in Aravallis, including Haryana and Rajasthan. Ordered strict monitoring via satellite imagery and field inspections.
10.	CAMPA Act (2016)	Used compensatory afforestation funds for ecological restoration of degraded forest areas in Aravalli hills.
11.	Draft Aravalli Biodiversity Park & Corridors	NCR Planning Board and Rajasthan Forest Department initiated urban green zones, wildlife corridors in Delhi, Gurugram, and Alwar regions.
12.	Public-Private Conservation Models	NGOs (e.g., I am Gurgaon, Aravalli Bachao Movement) partnered with local governments to regenerate parts of Aravallis.
13.	Satellite-based Monitoring (FRA, Bhuvan, FSI)	Improved monitoring of encroachments, illegal activities, and afforestation success in the Aravalli ecosystem.

Conclusion

The Aravalli range is not just a geological marvel but also a bastion of plant diversity. Its unique flora, adapted to harsh environmental conditions, holds immense ecological, medicinal, and cultural value. However, the growing pressures from mining, habitat degradation, and climate change threaten this rich heritage. There is an urgent need for coordinated conservation efforts involving government, researchers, and local communities. Reviving the Aravalli ecosystem will not only protect plant diversity but also ensure water security, climate stability, and sustainable livelihoods for future generations.

References

1. Balakrishnan TS, Unnikrishnan P, Murty AVS. The tectonic map of India and contiguous areas. J Geol Soc India,2009:74:158–168.
2. Bhavan P. State of Environment. Fleisch T, *et al*. A new clean diesel technology: demonstration of ULEV emissions on a Navistar diesel engine fuelled with dimethyl ether, SAE Technical Paper, 2000.
3. Chhangani AK, Robbins P, Mohnot SM, Sharma BK. Threats to faunal diversity of the Aravalli Hills with special reference to Kumbhalgarh Wildlife Sanctuary. In: Faunal heritage of Rajasthan, India: Conservation and management of vertebrates. Springer International Publishing, 2013, 93–112.
4. Dwivedi NK, Dhariwal OP, Gopala Krishnan S, Bhandari DC. Distribution and extent of diversity in Cucumis species in the Aravalli ranges of India. Genet Resour Crop Evol,2010:57:443–452.
5. Gurjar GN, Swami S. Climate change impacts in Rajasthan: A mitigation approach. Int J Chem Stud,2019:7(3):902–905.
6. Jain P, Bhasin A, Talukdar G, Habib B. Distribution and population status of Sambar Rusa unicolor (Mammalia: Cetartiodactyla: Cervidae) from Aravalli landscape with a note on its first record from Aravalli Hills of Haryana, India. J Threat Taxa,2018:10(10):12357–12362.
7. Kapoor M, Kohli K. The second act: Centre-State conversations on ecologically sensitive areas (2009–2012). Kalpavriksh, NCR & Duleep Matthai Nature Conservation Trust, 2012.
8. Mamtani MA, Karanth RV, Merh SS, Greiling RO. Tectonic evolution of the southern part of Aravalli Mountain Belt and its environs: Possible causes and time constraints. Gondwana Res,2000:3(2):175–187.
9. Moharana PC. ICAR-Central Arid Zone Research Institute, Jodhpur: Erosion processes and desertification in the Thar Desert of India. In: Proceedings, 2016, 1117–1140.
10. Paliwal BS. Abrupt Holocene climatic change in northwestern India: Disappearance of the Sarasvati River and the end of Vedic civilization. Wiley,2011:193:185–194.
11. Roy AB, Purohit R. Lithostratigraphic, geochronological and depositional framework of the Precambrian basins of the Aravalli Mountains and adjoining areas, Rajasthan, India, 2015, 55-65.
12. Sharma AK. Prehistoric Delhi and its neighbourhood: Physical features. In: Delhi Ancient History. Social Science Press, 2006, 14–25.
13. Sharma C, Sisodia SS. Peoples' participation in watershed development program: A case study of Rajasthan. Indian Res J Ext Educ,2008:8(1):71–72.
14. Sharma SK. Medicinal plant diversity in Aravallis. Int J Phytocos Nat Ingred,2019:6(1):3.
15. Singh G, Sharma R. Effects of different land use changes and spatial variation in rainfall on soil properties and soil carbon storage in Western Rajasthan, India. Ann Adv Agric Sci,2017:1(2):43–53.
16. Singh G, Mishra D, Singh K, Parmar R. Effects of rainwater harvesting on plant growth, soil water dynamics and herbaceous biomass during rehabilitation of degraded hills in Rajasthan, India. For Ecol Manag,2013:310:612–622.
17. Singh RANI. Ecological changes in Central Aravalli hilly range: A case study of Tonk District, Rajasthan, India. Int J Res Appl Nat Soc Sci,2015:3(4):17–28.
18. Singh R, Qureshi Q, Sankar K, Krausman PR, Goyal SP, Nicholson KL. Population density of striped hyenas in relation to habitat in a semi-arid landscape, western India. Acta Theriol,2014:59(3):371–379. https://doi.org/10.1007/s13364-014-0176-6
19. Singh S. Judicial approach regarding mining activities with special reference to the concept of sustainable development. Indian J Law Justice,2013:4:150.
20. Sinha GN, editor. An introduction to the Delhi Ridge. Department of Forests & Wildlife, Government of NCT of Delhi, 2014.
21. Tewari HC, Dixit MM, Sarkar D, Kaila KL. A crustal density model across the Cambay Basin, India, and its relationship with the Aravallis. Tectonophysics,1991:194(1–2):123–130.