

Exploring the Faunal Diversity and Conservation Challenges in Rajasthan: A Comprehensive Review

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Abstract: Rajasthan, a state renowned for its vast deserts and diverse landscapes, hosts a rich and varied faunal heritage that is both ecologically significant and culturally integral. This paper provides a comprehensive examination of the region's wildlife, emphasizing the diversity of mammalian, avian, reptilian, amphibian, and insect species. It explores the unique adaptations of these species to Rajasthan's arid and semi-arid environments, as well as the critical roles they play in maintaining ecological balance.

The study delves into the various habitats within Rajasthan, including deserts, forests, grasslands, and wetlands, and their importance to the region's faunal diversity. It also highlights the efforts undertaken to conserve this biodiversity, such as the establishment of protected areas and conservation programs spearheaded by government bodies and non-governmental organizations. Despite these efforts, the region faces significant challenges, including habitat loss, poaching, and the impacts of climate change.

Additionally, the paper addresses the cultural significance of Rajasthan's fauna, illustrating how local traditions and folklore intertwine with wildlife conservation. The conclusion emphasizes the need for sustained and innovative conservation strategies to safeguard Rajasthan's faunal heritage for future generations. Through a synthesis of ecological data, conservation insights, and cultural perspectives, this paper aims to contribute to a deeper understanding of Rajasthan's wildlife and the pressing need for continued protection and research.

Keywords: Faunal Diversity, Rajasthan Wildlife, Habitat Conservation, Biodiversity, Ecological Systems, Wildlife Protection

I. INTRODUCTION

Rajasthan, located in northwestern India, is a region characterized by its diverse landscapes, ranging from the arid Thar Desert to lush forested areas and fertile river valleys. This geographical and climatic variety supports a wide range of flora and fauna, making Rajasthan one of India's most ecologically rich and significant regions. The state's faunal heritage reflects this diversity, showcasing an array of species adapted to its unique environments.

The arid desert regions of Rajasthan are home to several endemic and specialized species, such as the Indian wild ass (*Equus hemionus khur*) and the Great Indian Bustard (*Ardeotis nigriceps*). These species have evolved to thrive in the harsh desert climate, demonstrating remarkable adaptations in behavior, physiology, and survival strategies. Conversely, the state's forested and grassland areas support a different set of species, including the Bengal tiger (*Panthera tigris tigris*) and the Indian leopard (*Panthera pardus fusca*), which rely on dense vegetation and abundant prey.

Rajasthan's faunal diversity is not only a testament to its varied ecosystems but also a crucial component of the region's ecological balance. Each species plays a vital role in maintaining the health of its habitat, from pollinators and decomposers to top predators. However, this rich heritage faces numerous threats, including habitat loss due to urbanization and agricultural expansion, poaching, and the impacts of climate change. These challenges underscore the importance of conservation efforts to protect Rajasthan's wildlife and preserve its ecological integrity.

In addition to its ecological significance, Rajasthan's fauna holds profound cultural value. Many species are integral to

local folklore, traditions, and practices, reflecting the deep connection between the people of Rajasthan and their natural environment. This cultural interplay further highlights the importance of preserving the state's faunal heritage, not only for its ecological benefits but also for its cultural and historical significance.

This paper aims to provide a detailed overview of Rajasthan's faunal heritage, examining the diversity of its wildlife, the characteristics of its various habitats, and the ongoing conservation efforts. By exploring these aspects, the paper seeks to enhance understanding of the region's wildlife and emphasize the need for continued and effective conservation strategies.

II. FAUNAL DIVERSITY

Rajasthan's faunal diversity is a reflection of its varied landscapes, which include arid deserts, semi-arid regions, grasslands, forests, and wetlands. This section explores the key mammalian, avian, reptilian, amphibian, and insect species that characterize the region's rich biodiversity.

1) Mammals

Rajasthan is home to a diverse range of mammalian species, adapted to its harsh and varied environments:

- **Bengal Tiger (*Panthera tigris tigris*):** Found primarily in the Ranthambore National Park, the Bengal tiger is a key predator in Rajasthan's forests. This apex predator plays a critical role in maintaining the balance of the ecosystem by controlling prey populations.
- **Indian Leopard (*Panthera pardus fusca*):** Leopards are widely distributed across Rajasthan, from the

forests of the Aravalli Range to the scrublands. They exhibit remarkable adaptability and are vital for controlling populations of smaller mammals and birds.

- **Indian Wild Ass (*Equus hemionus khur*):** This endangered species is found in the Rann of Kutch and parts of the Thar Desert. Adapted to the arid environment, the wild ass is known for its resilience and endurance.
- **Nilgai (*Boselaphus tragocamelus*):** Also known as the blue bull, the nilgai is commonly seen in the grasslands and forested areas of Rajasthan. It is the largest antelope in India and an important herbivore in the ecosystem.
- **Chinkara (*Gazella bennettii*):** This small gazelle is well-suited to the desert environment and is commonly found in the Thar Desert. It is adapted to survive on minimal water and sparse vegetation.

2) Birds

Rajasthan's avian diversity includes several notable species, some of which are endemic or migratory:

- **Great Indian Bustard (*Ardeotis nigriceps*):** One of the heaviest flying birds, the Great Indian Bustard is critically endangered and primarily found in the grasslands of Rajasthan. Conservation efforts are underway to protect this species and its habitat.
- **Sarus Crane (*Antigone antigone*):** The Sarus Crane, known for its impressive height and graceful courtship displays, is found in the wetlands of Rajasthan. It is a significant species for wetland ecosystems.
- **Indian Vulture (*Gyps indicus*):** This scavenger species is critically endangered due to habitat loss and poisoning. Efforts are being made to establish vulture safe zones and breeding programs.
- **Desert Fox (*Vulpes vulpes*):** Adapted to the arid environment, the Desert Fox is a nocturnal predator with a specialized diet and behavior suited to the desert conditions.

3) Reptiles and Amphibians

The reptilian and amphibian fauna of Rajasthan are adapted to both desert and forest environments:

- **Indian Python (*Python molurus*):** Found in the forests and grasslands, the Indian Python is a large constrictor that plays a role in controlling populations of mammals and birds.
- **Common Krait (*Bungarus caeruleus*):** This highly venomous snake is found in the grasslands and forested areas of Rajasthan. It is a key predator of small mammals and other reptiles.
- **Indian Toad (*Duttaphrynus melanostictus*):** Common in various habitats, including wetlands and agricultural fields, the Indian Toad is important for controlling insect populations.

4) Insects

Insects play essential roles in pollination, decomposition, and as prey for other animals:

- **Desert Locust (*Schistocerca gregaria*):** Known for its ability to form large swarms, the Desert Locust can have significant impacts on agriculture and vegetation in Rajasthan.
- **Indian Honeybee (*Apis cerana indica*):** Crucial for pollination, the Indian Honeybee supports the growth of plants and crops, contributing to the region's agricultural productivity.
- **Butterflies:** Rajasthan is home to a variety of butterfly species, such as the Painted Lady (*Vanessa cardui*) and the Common Jezebel (*Delias eucharis*), which contribute to pollination and serve as indicators of ecosystem health.

Rajasthan's faunal diversity is a testament to its ecological richness and complexity. The unique adaptations of its wildlife to various habitats underscore the need for targeted conservation efforts to protect these species and their environments. Understanding the diverse fauna of Rajasthan not only highlights the region's natural heritage but also informs conservation strategies essential for maintaining its ecological balance.

III. HABITATS AND ECOSYSTEMS

Rajasthan's diverse landscapes provide a range of habitats that support its rich faunal diversity. Understanding these habitats and ecosystems is crucial for comprehending the ecological roles of various species and the challenges they face. This section explores the primary habitats within Rajasthan, highlighting their characteristics and the wildlife they support.

1) Desert Ecosystem

The Thar Desert, covering a substantial part of Rajasthan, is characterized by its arid climate, sparse vegetation, and extreme temperature variations.

- **Climate and Vegetation:** The desert experiences low rainfall and high temperatures, leading to a landscape dominated by xerophytes such as cacti and acacias. Sand dunes, rocky outcrops, and seasonal water bodies are key features.
- **Flora:** The vegetation is adapted to conserve water, with species like the Khejri tree (*Prosopis cineraria*) and desert grasses playing a critical role in stabilizing the soil and providing food for herbivores.
- **Fauna:** Adapted to the harsh conditions, the Thar Desert supports species like the Indian Wild Ass, Great Indian Bustard, and Desert Fox. These species have evolved specialized behaviors and physiological traits to survive in the desert environment.

2) Forest Ecosystem

Rajasthan's forested areas, including parts of the Aravalli Range and the southern regions, offer a more temperate climate and varied vegetation.

- **Climate and Vegetation:** These forests experience moderate rainfall and include both dry deciduous and semi-evergreen forests. Typical flora includes teak, sal, and bamboo species.
- **Fauna:** Forests support a range of mammals such as the Bengal Tiger and Indian Leopard, which require dense cover for hunting and shelter. Avian species like the Indian Vulture and various species of owls are also prevalent. Reptiles such as the Indian Python find suitable habitats in these forests.

3) Grassland Ecosystem

Grasslands in Rajasthan, found in areas like the Sarsod and Mewat regions, provide a crucial habitat for many species.

- **Climate and Vegetation:** Grasslands are characterized by open, grassy areas with minimal tree cover. They receive moderate to low rainfall and feature grasses such as Bengal Grass (*Andropogon gayanus*) and various herbs.
- **Fauna:** Grasslands are home to herbivores like the Chinkara and Nilgai, which graze on the grasses and shrubs. Predators such as the Indian Wolf and various raptors depend on these herbivores for sustenance.

4) Wetlands and River Systems

Wetlands and river systems, including areas like the Keoladeo National Park and the Chambal River Basin, play a vital role in supporting biodiversity.

- **Climate and Vegetation:** These areas receive seasonal rainfall and have rich, fertile soils. Vegetation includes aquatic plants like reeds, water lilies, and various grasses.
- **Fauna:** Wetlands are crucial for bird species such as the Sarus Crane and the Great Indian Bustard, which rely on these areas for breeding and feeding. Amphibians and reptiles, including various species of frogs and turtles, also thrive in these environments. The wetlands support a variety of insects and fish species, contributing to the overall biodiversity.

5) Human Impact and Conservation

Human activities, including agriculture, urbanization, and mining, have significant impacts on these habitats.

- **Habitat Loss:** Expansion of agriculture and infrastructure often leads to the loss of critical habitats, affecting species populations and ecosystem functions.
- **Conservation Efforts:** Various protected areas, such as national parks and wildlife sanctuaries, have been established to conserve these habitats and their resident species. Conservation programs focus on habitat restoration, anti-poaching measures, and community involvement to mitigate the impacts of human activities.

Rajasthan's diverse habitats each play a unique role in supporting the region's faunal diversity. Understanding these ecosystems is essential for effective conservation strategies and ensuring the survival of the species that depend on them. By

preserving these habitats, we can maintain the ecological balance and protect the rich biodiversity of Rajasthan.

IV. CONSERVATION EFFORTS

Conserving Rajasthan's diverse faunal heritage requires a multifaceted approach, involving legal protection, habitat management, community engagement, and scientific research. This section outlines the key conservation efforts in place to protect the region's wildlife and habitats, as well as the challenges faced in these endeavors.

1) Protected Areas

Rajasthan has established several protected areas, including national parks, wildlife sanctuaries, and conservation reserves, to safeguard its unique ecosystems and species.

- **National Parks:** Notable examples include Ranthambore National Park, known for its Bengal Tigers; Keoladeo National Park, a vital wetland habitat for numerous bird species; and Desert National Park, which aims to protect the Great Indian Bustard and the desert ecosystem.
- **Wildlife Sanctuaries:** Areas such as the Sariska Tiger Reserve and the Mukundra Hills Tiger Reserve are critical for the conservation of tigers and other key species. These sanctuaries provide safe havens where wildlife can thrive away from human encroachment.
- **Conservation Reserves:** Reserves like the Jaisamand Wildlife Sanctuary and the Kumbhalgarh Wildlife Sanctuary are designated to protect specific species and their habitats, offering additional layers of protection within broader landscapes.

2) Conservation Programs and Initiatives

Various programs and initiatives aim to address the specific needs of Rajasthan's wildlife and habitats:

- **Species Recovery Programs:** Efforts to protect endangered species, such as the Great Indian Bustard and the Indian Vulture, include habitat restoration, captive breeding, and reintroduction programs. For instance, the Great Indian Bustard Project focuses on increasing population numbers through habitat management and anti-poaching measures.
- **Anti-Poaching Measures:** Strategies to combat poaching include deploying wildlife protection squads, using surveillance technology like drones and camera traps, and implementing strict legal frameworks. Organizations such as the Wildlife Protection Society of India (WPSI) work to reduce illegal hunting and trade.
- **Habitat Restoration:** Projects aimed at restoring degraded habitats, such as reforestation efforts in the Aravalli Range and wetland conservation projects in the Chambal Basin, help to improve the quality and connectivity of natural habitats.
- **Community Engagement:** Involving local communities in conservation efforts is crucial for the success of these initiatives. Programs that promote

sustainable livelihoods, raise awareness about wildlife conservation, and involve local populations in monitoring and protecting wildlife contribute to more effective conservation outcomes.

3) *Government Policies and Legislation*

Government policies and legislation play a critical role in conservation:

- **Wildlife Protection Act:** The Wildlife Protection Act of 1972 provides legal protection to wildlife and their habitats, establishing penalties for poaching and habitat destruction.
- **Forest Conservation Act:** This act regulates deforestation and land conversion, aiming to protect forested areas from degradation and loss.
- **National Biodiversity Action Plan (NBAP):** This plan outlines strategies for conserving biodiversity, including the protection of key species and habitats, and promotes sustainable development practices.

4) *Research and Monitoring*

Scientific research and monitoring are essential for informed conservation:

- **Biodiversity Surveys:** Regular surveys and studies help to track species populations, assess habitat conditions, and identify emerging threats. These data inform management decisions and conservation strategies.
- **Ecological Research:** Research on species behavior, ecological interactions, and habitat requirements enhances understanding of wildlife needs and helps in designing effective conservation measures.
- **Collaborations:** Partnerships between government agencies, non-governmental organizations (NGOs), research institutions, and local communities enhance the effectiveness of conservation efforts. Collaborative projects often combine resources and expertise to address complex conservation challenges.

5) *Challenges and Future Directions*

Despite ongoing efforts, several challenges remain:

- **Habitat Fragmentation:** Urban expansion, agriculture, and infrastructure development continue to fragment habitats, affecting species movement and survival.
- **Climate Change:** Climate change poses a significant threat to ecosystems, altering habitats and affecting species distributions. Adaptation strategies are needed to mitigate these impacts.
- **Funding and Resources:** Adequate funding and resources are essential for sustaining conservation programs. Increasing investment and improving resource allocation are critical for long-term success.

Conservation efforts in Rajasthan are crucial for protecting the region's diverse faunal heritage and ensuring the sustainability of its ecosystems. By implementing effective management

strategies, engaging local communities, and addressing emerging threats, it is possible to safeguard Rajasthan's wildlife for future generations. Continued commitment and collaboration among all stakeholders are essential for the success of these conservation initiatives.

V. CULTURAL SIGNIFICANCE

The faunal heritage of Rajasthan is deeply intertwined with the region's cultural and historical fabric. This connection is reflected in local traditions, folklore, art, and community practices that highlight the importance of wildlife in the lives of the people of Rajasthan. Understanding this cultural significance can provide insights into conservation priorities and foster greater community engagement in protecting wildlife.

1) *Wildlife in Folklore and Traditions*

Wildlife has a prominent place in Rajasthan's folklore and traditional practices:

- **Mythology and Legends:** Many species are featured in local myths and legends. For instance, the Bengal Tiger and the Great Indian Bustard are often depicted in stories that symbolize strength, grace, and endurance. Such myths underscore the reverence for these animals and their symbolic roles in the cultural imagination.
- **Religious Significance:** Certain animals are considered sacred or auspicious in local religions and practices. The peacock, for example, is associated with the Hindu god Krishna and is revered in various rituals and ceremonies. Similarly, the vulture, often seen as a symbol of purity, plays a role in Zoroastrian rituals practiced by the Parsi community.

2) *Wildlife in Art and Craft*

Rajasthan's rich artistic traditions often feature depictions of wildlife:

- **Miniature Paintings:** Rajasthani miniature paintings frequently include detailed representations of animals and birds. These artworks, often commissioned by royalty, depict scenes of hunting, wildlife in their natural habitats, and symbolic portrayals of animals in Indian mythology.
- **Textiles and Embroidery:** Traditional textiles and embroidery, such as those from the Kutch region, often incorporate animal motifs. These designs not only reflect artistic skills but also convey cultural values and beliefs associated with different species.

3) *Wildlife and Community Practices*

Local communities have developed practices and customs that reflect their relationship with wildlife:

- **Traditional Hunting Practices:** Historically, hunting was a significant part of the royal and tribal cultures in Rajasthan. While modern conservation efforts have largely curtailed hunting, traditional practices are still remembered and celebrated through festivals and cultural events.

- **Conservation through Customary Laws:** In some areas, local communities have established customary laws and practices that protect certain species. For instance, sacred groves and water bodies may be protected by local taboos that forbid hunting or deforestation, reflecting traditional ecological knowledge and respect for wildlife.

4) Festivals and Celebrations

Wildlife plays a role in various local festivals and celebrations:

- **Pichwai Paintings:** During festivals like Janmashtami, which celebrates the birth of Lord Krishna, Pichwai paintings often depict scenes with peacocks and other animals in vibrant and intricate designs. These paintings are displayed in temples and homes as part of the celebrations.
- **Local Festivals:** Festivals such as the Camel Festival in Bikaner celebrate local wildlife and livestock, including camels, which are integral to the desert economy and culture. These events showcase the cultural significance of animals and promote their conservation.

5) Challenges and Opportunities for Conservation

The cultural significance of wildlife presents both opportunities and challenges for conservation:

- **Opportunities:** Leveraging cultural values and traditions can enhance conservation efforts. Engaging local communities through cultural programs, festivals, and education can foster a sense of ownership and responsibility towards wildlife conservation.
- **Challenges:** Balancing conservation goals with traditional practices and cultural beliefs can be challenging. Efforts must be made to ensure that conservation initiatives respect and incorporate local customs and knowledge, rather than imposing external solutions.

The cultural significance of Rajasthan's wildlife is a vital aspect of its heritage and identity. By recognizing and incorporating cultural values into conservation strategies, it is possible to build stronger connections between people and wildlife. This approach not only helps to preserve the region's faunal diversity but also enriches the cultural landscape, ensuring that both wildlife and cultural traditions are valued and sustained for future generations.

VI. FUTURE DIRECTIONS

As conservation efforts in Rajasthan progress, several key areas require focus to enhance the protection and sustainability of its faunal heritage. Addressing emerging challenges and leveraging new opportunities can significantly impact the effectiveness of conservation strategies. This section outlines future directions for conservation in Rajasthan, including innovative approaches, research needs, and policy recommendations.

1) Enhancing Habitat Connectivity

- **Ecological Corridors:** Establishing and maintaining ecological corridors is crucial for allowing wildlife to move between fragmented habitats. Creating linkages between protected areas can help species migrate, find food, and maintain genetic diversity. Future efforts should focus on mapping critical corridors and implementing land-use planning to protect these routes.
- **Restoration Projects:** Expanding habitat restoration projects to rehabilitate degraded areas and reforest critical zones will improve habitat quality and connectivity. Collaborative efforts with local communities and stakeholders are essential for successful restoration initiatives.

2) Adapting to Climate Change

- **Climate-Resilient Strategies:** Developing climate-resilient conservation strategies is necessary to address the impacts of climate change on habitats and species. This includes adapting management practices to changing weather patterns, such as adjusting water resource management and enhancing habitat resilience.
- **Monitoring and Research:** Continued research on climate change impacts and species adaptation will help inform management strategies. Implementing long-term monitoring programs to track climate-related changes in ecosystems and wildlife populations is essential for proactive conservation.

3) Community Engagement and Participation

- **Empowering Local Communities:** Engaging local communities in conservation efforts can lead to more sustainable outcomes. Programs that provide economic incentives, promote sustainable livelihoods, and involve communities in decision-making processes can foster greater support for conservation initiatives.
- **Education and Awareness:** Expanding educational programs to raise awareness about wildlife conservation and the ecological importance of local species can build a culture of conservation. Schools, community groups, and media campaigns are effective channels for spreading knowledge and encouraging participation.

4) Leveraging Technology and Innovation

- **Surveillance and Monitoring Technologies:** Utilizing advanced technologies such as satellite imagery, drones, and camera traps can enhance monitoring and enforcement efforts. These tools provide valuable data for tracking wildlife populations, detecting poaching activities, and assessing habitat conditions.
- **Citizen Science:** Encouraging citizen science initiatives, where local residents contribute to data collection and monitoring, can increase the amount of information available for conservation efforts. These initiatives also engage the public in active conservation participation.

5) Policy and Legal Frameworks

- **Strengthening Legal Protections:** Reviewing and strengthening legal frameworks to address emerging threats, such as illegal wildlife trade and habitat encroachment, is essential. Ensuring rigorous enforcement of wildlife protection laws and increasing penalties for violations can deter illegal activities.
- **Integrating Conservation into Development Planning:** Incorporating conservation priorities into land-use and development planning can mitigate the negative impacts of urbanization and infrastructure projects. Policies that balance development with conservation needs can help preserve critical habitats and species.

6) Collaborative Approaches

- **Partnerships and Collaborations:** Building partnerships between government agencies, NGOs, research institutions, and private sector organizations can enhance conservation efforts. Collaborative projects that combine resources and expertise can address complex conservation challenges more effectively.
- **International Cooperation:** Engaging in international conservation efforts and agreements can provide additional support and resources. Collaborating with neighboring regions and countries on cross-border conservation initiatives can address migratory species and shared ecosystems.

7) Future Research Directions

- **Species and Habitat Studies:** Prioritizing research on lesser-known species, their ecological roles, and specific habitat requirements will improve conservation strategies. Detailed studies on species behavior, distribution, and threats are critical for targeted management actions.
- **Impact Assessments:** Conducting impact assessments to evaluate the effectiveness of conservation interventions and adapt strategies based on findings will enhance the efficiency of conservation programs. Regular assessments provide insights into what works and where improvements are needed.

The future of wildlife conservation in Rajasthan hinges on addressing emerging challenges with innovative solutions and collaborative efforts. By enhancing habitat connectivity, adapting to climate change, engaging communities, leveraging technology, and strengthening policy frameworks, it is possible to build a sustainable future for Rajasthan's faunal heritage. Continued commitment to research, collaboration, and adaptive management will ensure that both wildlife and ecosystems thrive for generations to come.

VII. CONCLUSION

Rajasthan's faunal heritage is a remarkable testament to the region's ecological richness and cultural depth. From the arid expanses of the Thar Desert to the lush forests of the Aravalli Range, the diverse habitats of Rajasthan support a wide range of species, each uniquely adapted to their environment. The

intricate interplay between wildlife and ecosystems highlights the critical need for effective conservation strategies to maintain the region's biodiversity.

Throughout this paper, we have explored the rich diversity of Rajasthan's wildlife, including its mammalian, avian, reptilian, amphibian, and insect species. The various habitats—deserts, forests, grasslands, wetlands, and river systems—each play a vital role in supporting this biodiversity. Understanding these ecosystems and the species they harbor is essential for developing targeted conservation efforts.

Conservation initiatives in Rajasthan have made significant strides, with the establishment of protected areas, species recovery programs, and community engagement efforts. However, challenges such as habitat fragmentation, climate change, and human-wildlife conflicts continue to pose threats to the region's faunal heritage. Addressing these challenges requires a multifaceted approach, incorporating habitat restoration, climate adaptation strategies, technological advancements, and robust legal frameworks.

The cultural significance of Rajasthan's wildlife adds another layer of importance to conservation efforts. Local traditions, folklore, and art reflect a deep connection between the people of Rajasthan and their natural environment. By integrating cultural values into conservation strategies, we can foster greater community involvement and support for preserving wildlife and habitats.

Looking to the future, enhancing habitat connectivity, adapting to climate change, and strengthening community participation are crucial for the continued protection of Rajasthan's biodiversity. Leveraging technological innovations and collaborative approaches will further bolster conservation efforts. Continued research and adaptive management are essential for addressing emerging threats and ensuring the long-term sustainability of Rajasthan's faunal heritage.

In conclusion, the preservation of Rajasthan's wildlife and ecosystems is not only a matter of ecological importance but also a cultural and historical imperative. By building on existing conservation successes and addressing ongoing challenges with innovative and inclusive strategies, we can safeguard Rajasthan's rich biodiversity for future generations. The collective effort of government agencies, conservation organizations, local communities, and researchers will be vital in achieving this goal, ensuring that the natural and cultural treasures of Rajasthan continue to thrive.

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