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The Impact of Tourism Development on the Mountain Ecology of Ajmer District

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ABSTRACT

Ajmer district, situated in the central part of Rajasthan, is a significant tourist destination known for its historical heritage, religious importance, and the natural beauty of the Aravalli Range. This research paper analyzes the impacts of growing tourism development on the mountain ecology in Ajmer district. Three major mountain sites were selected in the study area—the Taragarh hill route, the Pushkar valley area, and the Tordgarh-Rawali route. The research employed a 10×10 meter quadrat method to survey solid waste and assess the environmental crises generated by tourism activities. Results indicate that plastic waste is the most prominent pollutant across all three sites, with the highest solid waste found in the Pushkar valley area and the lowest on the Tordgarh-Rawali route. Tourism activities have led to serious environmental crises such as soil erosion, loss of vegetation, disruption of wildlife habitats, and a decrease in water harvesting capacity. This study underscores the need for immediate intervention and policy improvements for sustainable tourism development.

Keywords: Ajmer district, Aravalli Range, tourism development, mountain ecology, solid waste management, plastic pollution, biodiversity, ecosystem, sustainable development

RESEARCH INTRODUCTION

Tourism is one of the fastest-growing economic activities in the modern world, serving as a vital medium for economic growth, job creation, cultural exchange, and regional development. In India, the tourism industry has witnessed unprecedented growth over the past few decades, particularly in Rajasthan. Ajmer district has become a major tourist hub due to its historical heritage, religious sites (the Dargah of Khwaja Moinuddin Chishti and Pushkar), and the natural beauty of the Aravalli Range. In 2024, Ajmer received a total of 2,25,89,808 domestic tourists, ranking it among the most visited districts in Rajasthan. Among these, the Pushkar fair alone in 2025 included approximately 600,000 domestic and 8,000 foreign tourists, while Pushkar annually attracts 1.88 million visitors, and the Ajmer Sharif Dargah receives 1.49 million devotees.

Ajmer's most distinctive feature is the Aravalli Range, which acts as a natural barrier between Marwar and Mewar. Peaks such as Nag Pahari (870 m), Taragarh (873 m), and Moramji/Tordgarh (934 m) are located here, crucial for biodiversity, drainage, and maintaining groundwater levels. However, increasing tourism development has placed severe pressure on these sensitive ecosystems. Aravalli hills are being cut for the construction of hotels, resorts, and roads, destabilizing the geomorphological structure. Excessive foot traffic from tourists increases soil erosion and landslide risks, while the lack of solid waste management leads to the accumulation of plastic waste, glass pieces, and packaged food wrappers on the hills, polluting the soil and obstructing the natural flow of rainwater.

Against this backdrop, this research paper analyzes the effects of tourism development on the mountain ecology of Ajmer district, focusing on three major sites—Taragarh, Pushkar valley, and Tordgarh-Rawali. The study presents an analysis of the quantity and composition of solid waste, identifies environmental crises, and suggests potential measures for sustainable tourism development.

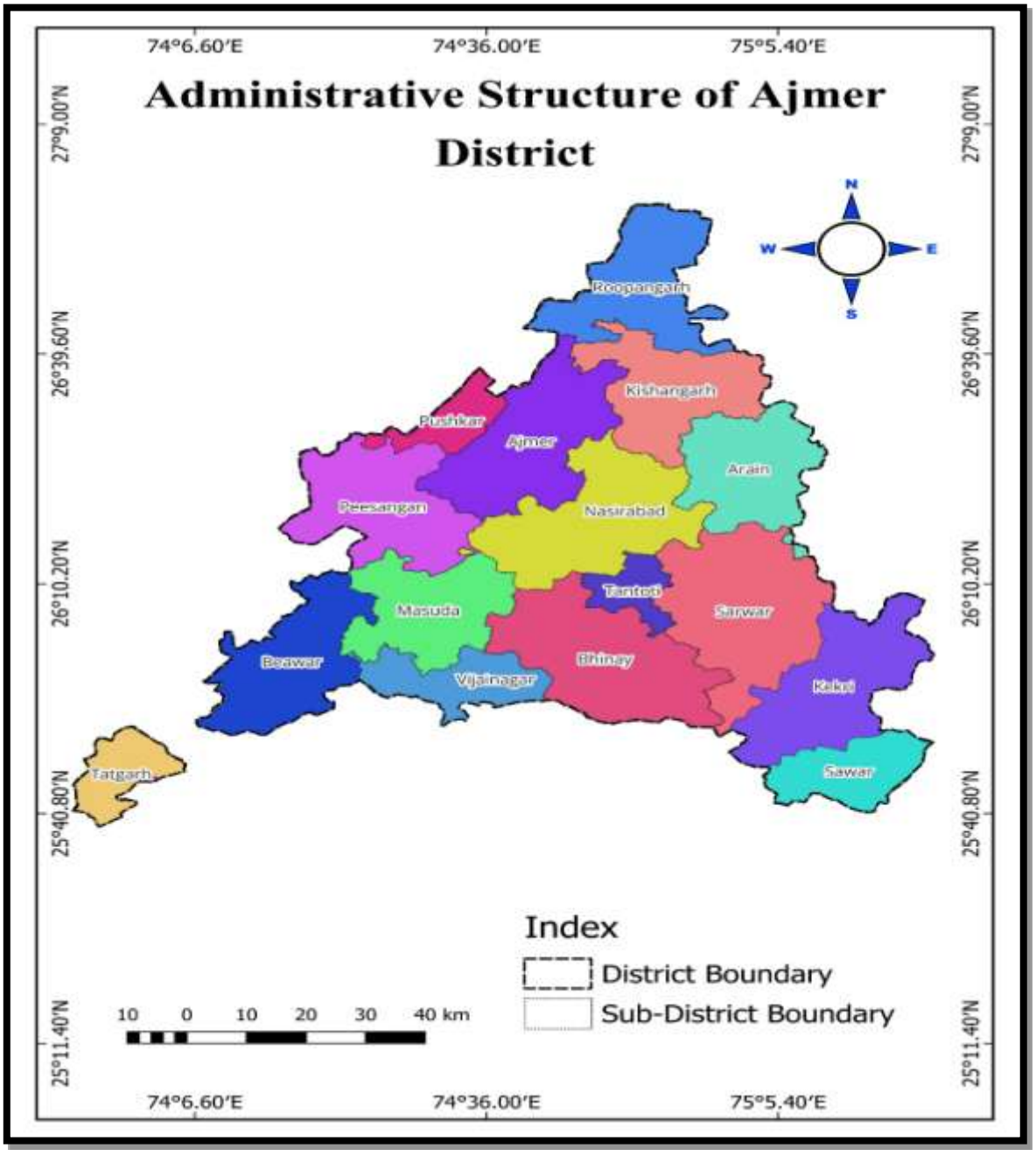
Study Area

Ajmer district is located in the central-eastern part of Rajasthan, between latitudes 26°25' to 26°55' North and longitudes 74°20' to 75°15' East. It is a significant district of Rajasthan due to its geographical, cultural, and historical features. The most distinct geographical feature of Ajmer district is the Aravalli Range, which divides the district east-west and serves as a natural barrier between the plains of Marwar and the plateaus of Mewar, influencing the climate,

vegetation, and water systems of the entire region. The study area includes three major sites. The first is Taragarh Hill (873 meters), a steep-sloped range southwest of Ajmer city, geologically composed mainly of resistant quartzite rocks, which has preserved it as a residual peak despite severe erosion; Taragarh Fort is situated on this peak, originally known as 'Ajaymeru Durg' or 'Gadh Beethli' and referred to as the 'Key to Rajputana' and the 'Gibraltar of Rajasthan,' geomorphologically serving as a strategic 'watch post' overlooking the entire central plains and transport routes.

The second major site is Nag Pahari (870 meters), located between the Ajmer and Pushkar valleys, named for its serpentine shape. It is a prominent parallel range of the Aravalli, acting as a barrier against desert winds and sand from the west and serving as the backbone of the drainage system of western Rajasthan; the Luni River (initially as Sabarmati) originates from its western slope, and its water retention capacity helps maintain the groundwater level of Pushkar Lake. The third major site is Moramji/Tordgarh (934 meters), situated in the far southwest of Ajmer in the Beawar/Tordgarh area (Rawali-Tordgarh Sanctuary region), and is the highest peak in the entire central Aravalli region, characterized by highly dissected plateaus and hill slopes covered with dry deciduous forests, geomorphologically acting as a transition zone between the high plains of Marwar and the mountainous region of Mewar. Besides these major peaks, Suliya Dungar (725 m), Tikli (618 m), and Tindli Dungar (595 m) are other prominent summits, while major pilgrimage sites like Pushkar and Savitri Mata Temple are located in the valleys of these hills. The central Aravalli ranges have been a major barrier to east-west transport, with narrow geomorphological gaps (passes) created by nature, known as 'Naal' or passes, to cross them.

Map-1



Research Objectives

The objectives of this research are as follows:

1. To analyze the quantity and composition of solid waste generated in mountainous areas due to tourism activities in Ajmer district.

2. To conduct a comparative study of the environmental impacts of various types of tourism activities on the Taragarh Hill route, Pushkar Valley area, and Tordgarh-Rawali route.

3. To identify environmental crises caused by tourism development, such as soil erosion, biodiversity loss, reduced water harvesting capacity, and disruption of wildlife habitats.

4. To assess the long-term effects of increasing tourism pressure on mountain ecology.

5. To suggest potential measures and policy improvements for sustainable tourism development in Ajmer district.

Data Sources and Research Methodology

This research utilizes primary data, with main sources including the results of solid waste surveys conducted using the 10×10 meter quadrat method at mountain tourist sites in Ajmer district, collected from three locations—Taragarh Hill route (Q-1), Pushkar Valley area (Q-2), and Tordgarh-Rawali route (Q-3). Other sources include geographical and geological details of Ajmer district, published research papers, reports, and government documents related to the Aravalli Range, the ecology of Ajmer district, and tourism development. The research methodology incorporates both qualitative and quantitative methods. The quadrat survey method was used to analyze the quantity and composition of solid waste in the study area, a standard method in environmental science for assessing waste accumulation in a specific area. Quadrats Q-1, Q-2, and Q-3 were selected at the three sites, and the collected waste was classified into three categories—plastic waste, glass waste, and organic/other waste.

RESEARCH RESULTS AND DISCUSSION

According to table-1 the quadrat survey revealed significant differences in the quantity and composition of solid waste at the three mountain tourist sites. From the Taragarh Hill route, a total of 10.5 kg of solid waste was collected, of which plastic waste was 4.8 kg (45.71%), primarily including plastic water bottles, soft drink cans, and chips/wafers wrappers; glass waste was 2.5 kg (23.81%), comprising broken glass bottles and glass pieces; and organic and other waste was 3.2 kg (30.48%), including food leftovers, paper cups, and cigarette butts.

This indicates that trekking and mountaineering activities are exerting significant pressure on this area in the form of plastic and solid waste, as the historical significance of Taragarh Fort attracts a large number of tourists, most of whom use plastic water bottles and packaged food, and the lack of waste collection systems on trekking routes leads to direct accumulation of this waste on the hills. The Pushkar Valley area recorded the highest solid waste—12.8 kg—the maximum among the three study sites, with plastic waste at 6.2 kg (48.44%), predominantly single-use plastic bags, disposable plates, and thermocol packaging; organic and other waste was 5.5 kg (42.97%), including coconut shells, residue from prayer materials, and wilted flowers; and glass waste was only 1.1 kg (8.59%).

This clearly indicates that religious and picnic activities contribute to the excessive accumulation of plastic and organic waste in this area, as Pushkar is a major pilgrimage site where thousands of devotees visit daily, generating large quantities of prayer materials, coconuts, flowers, and prasad remnants, while tourists coming for picnics use disposable plates and cups, impacting environmental quality. From the Tordgarh-Rawali route, a total of 4.4 kg of solid waste was collected, the lowest among the three sites, including 2.1 kg (47.73%) plastic waste, 1.8 kg (40.91%) organic and other waste, and only 0.5 kg (11.36%) glass waste, mainly consisting of packaged food wrappers, plastic spoons, dry twigs, food remnants from campfires, and tin cans. The relatively low amount of waste indicates that the number of tourists in this area is limited, and the natural environment is still relatively preserved, as Tordgarh-Rawali is a wildlife sanctuary with high ecological sensitivity, but limited tourism activities result in lower environmental pressure.

Comparative analysis concludes that plastic waste is the most prominent pollutant at all three sites, accounting for approximately 46-48%, which is a serious concern as plastic is non-biodegradable, chemically contaminates the soil, and obstructs the natural flow of rainwater. The Pushkar Valley area generates the highest amount of solid waste due to its religious significance and picnic activities, where single-use plastics and organic waste from prayer materials are the main issues. The Tordgarh-Rawali route has the lowest waste quantity due to limited tourism activities and ecological sensitivity, reflecting its relatively preserved condition. The composition of waste varies according to the nature of tourism activities, with plastic and prayer material-based organic waste being more prevalent at religious and picnic sites, while waste related to packaged food and beverages dominates at trekking and camping sites.

Table: Field-Based Solid Waste Quadrate Audit (10 X 10 Meter Grid) in Mountain Area in Ajmer District

Survey Location	Quadrate No. & Zone	Type of Waste	Total Weight Collected (Kg)	Percentage Composition	Dominant Items Found
Taragarh Hill Route	**Q-1** (Main Trekking Trail)	Plastic Waste	4.8	45.71%	Plastic water bottles, carbonated drink cans, wrappers of wafers/chips.
		Glass Waste	2.5	23.81%	Broken glass fragments and discarded beverage bottles.
		Organic / Misc.	3.2	30.48%	Leftover food items, paper cups, cigarette butts.
		Total (Q-1)	**10.5**	**100.00%**	
Pushkar Valley Area	**Q-2** (Picnic & Transition Zone)	Plastic Waste	6.2	48.44%	Single-use plastic bags, disposable plates, thermocol packaging.
		Glass Waste	1.1	8.59%	Glass shards, empty cosmetic/perfume containers.
		Organic / Misc.	5.5	42.97%	Coconut shells, ritual offerings residue (pooja samagri), decayed flowers.
		Total (Q-2)	**12.8**	**100.00%**	
Todgarh Raoli Route	**Q-3** (Eco-Camping Site)	Plastic Waste	2.1	47.73%	Packaged food wrappers, plastic spoons, and forks.
		Glass Waste	0.5	11.36%	Minor glass fragments (minimal occurrence).
		Organic / Misc.	1.8	40.91%	Dry twigs, discarded campfire food scraps, tin cans.
		Total (Q-3)	**4.4**	**100.00%**	

Source: Field Survey Conducted by Researcher in 2025

Tourism development has caused numerous severe impacts on the mountain ecology of Ajmer district. The cutting of Aravalli hills for the construction of hotels, resorts, and paved roads has completely destabilized the area's original geomorphological structure. Excessive foot traffic (trampling effect) from tourists loosens and displaces the top protective soil on trekking routes and off-trail sites, significantly increasing the risk of severe soil erosion and landslides during the rainy season. Indiscriminate felling of local tree species—such as Dhok, Dhak, and Salar—for resort construction and night camping is continuously shrinking the green cover on the mountains, which not only affects biodiversity but also reduces soil stability and water harvesting capacity. Intense noise pollution from tourist vehicles, horns, and loudspeakers, along with artificial night lighting from resorts, is disrupting the natural habitats of wildlife—such as panthers, Chousingha (four-horned antelope), and other species residing in the Tordgarh-Rawali Wildlife Sanctuary—resulting in their migration away from these areas towards deeper forests.

The Aravalli hills act as a natural water divide for the entire Ajmer district, but increasing illegal concrete construction and debris dumping on the hills are continuously reducing the land's natural water absorption capacity. Consequently, instead of percolating into the hills, rainwater flows rapidly off the surface, causing sedimentation in downstream lakes like Anasagar and Pushkar and severely imbalancing the groundwater levels across the region. Furthermore, the lack of solid waste management systems in mountainous areas leads to the accumulation of packaged food waste, plastic bottles, wrappers, and glass pieces on the hills, chemically contaminating the soil and obstructing the natural flow of rainwater.

CONCLUSION

At all three mountain tourist sites in Ajmer district, plastic waste (46-48%) is the most prominent pollutant, posing a long-term threat to soil, water, and wildlife due to its non-biodegradable nature. The Pushkar Valley area, due to its religious significance, recorded the highest amount of solid waste (12.8 kg), where single-use plastics and prayer materials are the main issues. Waste composition varied according to the nature of tourism activities—religious/picnic sites had more plastic and organic waste, while trekking/camping sites were dominated by packaged food-based waste. Tourism development has generated serious crises including soil erosion, loss of vegetation, disruption of wildlife habitats, and reduced water harvesting capacity, destabilizing the environmental balance and jeopardizing the long-term sustainability of tourism.

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