

Natural Resource Structure and Tourism–Landscape Relationships in Chikhaldara Hill Station, Maharashtra

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ABSTRACT:

Chikhaldara, in Maharashtra's Satpura ranges, attracts visitors through a combination of elevated viewpoints, rugged slopes, forested valleys and water features. This paper examines how these landscape elements relate to the location and character of tourist sites, and considers the pressures that may arise when visitor facilities and access routes overlap with sensitive terrain. The analysis draws on the source study's documentary material, Google Earth-based location map, field observations and photographs. It identifies a recurring pattern: viewpoints depend on ridges and plateau margins, water attractions depend on drainage and catchment conditions, and forests contribute both to ecological functioning and to the destination's visual character. These relationships are described qualitatively; the available material does not support statistical claims about the magnitude or causes of environmental change. The paper uses the findings to outline practical priorities for terrain-sensitive development, view-shed protection, drainage continuity, forest-edge management and visitor facilities, and identifies the spatial data needed for future testing.

Keywords: Chikhaldara, natural resources, tourism landscape, sustainable tourism, landscape planning

1. Introduction

Tourism in hill stations is closely associated with the natural landscape, which shapes the location, character and attractiveness of tourist destinations. Landforms, vegetation, water resources and scenic viewpoints influence not only the visitor experience but also the development of roads, accommodation and other tourism-related infrastructure. Unlike destinations where attractions are primarily constructed, hill stations often derive much of their appeal from existing environmental features, including elevated ridges, valleys, plateaus, waterfalls, lakes and forested slopes. These features provide opportunities for sightseeing, recreation and nature-based tourism while performing important ecological functions. Understanding the relationship between natural resources and tourism is therefore essential for the sustainable planning and management of hill

destinations. Landscape and tourism planning documents similarly frame natural and cultural assets as central considerations in destination development (Dalal Mott MacDonald, 2003; Government of Maharashtra, 2025). (Government of Maharashtra, 2025; UN Tourism, 2023).

Chikhaldara Hill Station, situated in the Satpura ranges of Amravati district, Maharashtra, provides an appropriate setting for examining these relationships. The area is characterised by varied topography, including ridges, plateaus, scarps, valleys and gorges, together with lakes, streams, seasonal cascades and forested landscapes. Important tourist locations include Devi Point, Hurricane Point, Goraghat Point, Monkey Point, Panchbol Point, Prospect Point, Thakur Point, Mozari Point, Shakkar Lake, Kalapani Lake, Bhimkund and Gawilgarh Fort. The appeal of these locations is closely connected with their

surrounding landscape. Elevated landforms provide panoramic views, water features contribute to the scenic character of the region, and forest cover enhances the visual quality of roads, viewpoints and recreational areas. Gawilgarh Fort further illustrates how a heritage attraction can derive part of its tourism value from its elevated position and natural surroundings. (Department of Tourism, Government of Maharashtra, n.d.; Government of Maharashtra, 2025).

Natural resources in such destinations should not be viewed merely as background elements for tourism. Their physical and ecological functions influence the long-term quality of the visitor experience. Ridges and plateau margins provide viewing opportunities but may be sensitive to excavation, construction and erosion. Valleys and gorges create distinctive scenery while also functioning as drainage corridors and habitats. Lakes and seasonal watercourses depend on their surrounding catchments, while vegetation contributes to soil protection, habitat continuity and the visual character of the landscape. Consequently, changes to one component may influence other parts of the tourism environment. Examining these connections can help explain why landscape-sensitive planning is important for destinations such as Chikhaldara. (Varghese & Yelisetty, 2006; UN Tourism, 2023).

Tourism development can place increasing demands on the natural landscapes that attract visitors. Road widening, construction, vehicle movement, informal parking, waste disposal, vegetation clearance and unregulated visitor access may disturb sensitive areas. At viewpoints, buildings and other structures can obstruct important sightlines, while development on slopes may expose soil or alter surface runoff. Around lakes and water margins, unmanaged visitor activities can contribute to litter and localised disturbance. Forest edges may also experience gradual modification as tourism facilities and access routes expand. These pressures are interconnected and may extend beyond the immediate boundaries of individual tourist attractions. (Štrba et al., 2022; Government of Maharashtra, 2025).

Although the tourism potential and natural-resource importance of Chikhaldara are recognised in the available literature and planning material, the relationship between the physical landscape and the distribution of tourist locations requires further examination. An attraction-centred approach may identify facilities and visitor requirements at particular sites without adequately considering the wider

landforms, drainage systems, vegetation and visual corridors that sustain their appeal. A landscape-based perspective is therefore needed to understand how tourism opportunities and environmental sensitivities overlap. (Department of Tourism, Government of Maharashtra, n.d.; Pande, 2016; Wagay et al., 2019).

Against this background, the present study examines the relationship between natural-resource structure and tourism in Chikhaldara Hill Station. Its specific objectives are to identify the principal landform, water and vegetation features associated with selected tourist locations; examine how these resources contribute to tourism experiences and ecological functions; identify potential environmental pressures arising at the interface between tourism and sensitive landscape features; and propose planning and management measures that can support the long-term quality of the destination. The study uses documentary information, the available Google Earth-based location map, field observations and photographic records to develop a qualitative interpretation of these relationships. It does not seek to establish statistical causation or quantify environmental impacts that were not measured.

The available literature on Chikhaldara and the wider Melghat region addresses natural-resource management, ecotourism, regional ecology and tourism planning. Forest-management research on the East Melghat Forest Division demonstrates the relevance of spatial information to forest planning (Varghese & Yelisetty, 2006). Wagay et al. (2019) document ethnobotanical knowledge and plant use among the Korku community in the Melghat forest area, highlighting the region's ecological and cultural significance. Government tourism-planning documents also provide a policy context for sustainable tourism development in Maharashtra (Dalal Mott MacDonald, 2003; Government of Maharashtra, 2025). (Pande, 2016; Varghese & Yelisetty, 2006; Wagay et al., 2019).

Taken together, these sources establish the relevance of natural resources, ecological context and planning considerations to Chikhaldara's tourism development (Dalal Mott MacDonald, 2003; Government of Maharashtra, 2025; Varghese & Yelisetty, 2006; Wagay et al., 2019). However, the references available in the source manuscript do not provide a sufficiently systematic basis for claiming that previous research has comprehensively assessed the spatial relationships between individual tourist locations and their supporting landscape systems. This study addresses that issue through a descriptive comparison of tourist locations, landforms, water features, vegetation and

potential pressure pathways. (Government of Maharashtra, 2025; UN Tourism, 2023).

2. Literature Review

2.1 Natural Resources as Interacting Landscape Systems

Natural resources in a hill-station environment are closely interconnected, and their contribution to tourism cannot be fully understood by examining individual features in isolation. Landforms influence surface drainage and the movement of water, while soil moisture and water availability affect vegetation distribution. Vegetation, in turn, contributes to soil stability, infiltration and the visual character of the landscape. These interactions are particularly relevant to Chikhaldara, where the tourism environment comprises elevated terrain, valleys, gorges, water bodies and forested areas. The resource categories identified in the original study—land, water, vegetation and energy—therefore provide a useful basis for examining the landscape, although the available evidence is more detailed for landforms, water and vegetation than for energy resources. (Varghese & Yelisetty, 2006; Wagay et al., 2019; Hall & Page, 2014; Dudley, 2008).

The physical characteristics of individual landforms also influence their tourism functions. Plateaus and ridges provide elevated surfaces and opportunities for panoramic views, whereas valleys create visual depth and gorges produce a more enclosed landscape experience. Scarps form prominent edges that may support viewpoints and seasonal waterfalls, while saddles connect higher areas and may influence access routes. At the same time, these features perform ecological and physical functions associated with drainage, vegetation distribution and habitat. Understanding their combined roles is important because changes to a landform can affect both the environmental condition of the site and the experience it offers visitors. In this context, the relationship between natural resources and tourism is best examined at the landscape-system level rather than solely through the boundaries of individual attractions. (Varghese & Yelisetty, 2006; Leung et al., 2018).

2.2 Hill-Station Tourism and Topographic Advantage

Topography is an important consideration in understanding the spatial character of hill-station tourism. Elevated locations provide opportunities for

distant views, while plateau margins, ridges and valley edges create contrasts in elevation that contribute to scenic appeal. These characteristics are reflected in the selected tourist locations in Chikhaldara, including Devi Point, Hurricane Point, Goraghat Point, Monkey Point, Panchbol Point, Prospect Point, Thakur Point and Mozari Point. The available location map and photographic documentation indicate an association between these viewpoints and elevated landforms. This observation supports a qualitative interpretation of the role of topography in shaping the tourism landscape, although it does not establish that elevation alone determines the location of tourist attractions. Accessibility, historical development and visitor preferences may also influence their distribution. (Department of Tourism, Government of Maharashtra, n.d.).

The tourism value of an elevated viewpoint also depends on the wider landscape visible from that location. The viewing experience may be affected by changes to the foreground, surrounding slopes, opposite valley walls or distant ridgelines, even when the viewpoint itself remains physically unchanged. Consequently, the management of viewpoints should consider the surrounding visual landscape as well as the immediate visitor area. For Chikhaldara, this perspective highlights the importance of considering development along prominent plateau margins, ridges and approach routes when planning tourism infrastructure. However, the present study interprets these relationships descriptively; it does not include GIS-based viewshed calculations or quantitative measurements of visual change. (UN Tourism, 2023; Government of Maharashtra, 2025).

The following multi-page inventory follows the large-table treatment used in the supplied reference paper. It reorganises the original study's landform and resource evidence into a consistent structure linking physical character, tourism role, ecological function, relationship and pressure. Tables 1–3 summarise the resource inventory, landscape dependencies of selected tourist locations, and potential pressure pathways.

The natural-resource inventory summarises the physical characteristics, tourism functions, ecological roles and potential pressures associated with the principal landscape features (Table 1).

Table 1. Detailed Natural-Resource Inventory and Tourism Relationship

Category	Resource / feature	Physical character	Tourism role / use	Ecological / landscape role	Relationship	Principal pressure
Land	Plateau / elevated surface	Broad high surface forming the hill-station setting	Supports settlement, roads, tourism facilities and access to viewpoints	Controls runoff direction; supports vegetation and habitat mosaics	Interdependent	Construction, impervious surface, edge disturbance
Land	Ridge	Elongated elevated landform and drainage divide	Viewpoints, scenic drives, orientation and borrowed views	Drainage division, habitat continuity and wind exposure	Interdependent	Road widening, construction, visual intrusion
Land	Steep slope	Inclined terrain connecting plateaus and valleys	Scenic backdrop and approach experience	Runoff transfer, erosion sensitivity, vegetation support	Interdependent	Cut-and-fill, erosion, slope instability
Land	Valley	Low land between hills, commonly associated with drainage	Scenic depth, borrowed views and landscape contrast	Drainage corridor and habitat	Interdependent	Development, drainage alteration, waste
Land	Gorge	Narrow steep-sided valley	Waterfall/stream setting and dramatic scenery	Water movement, shaded habitat and geomorphic expression	Interdependent	Erosion, unsafe access, visitor disturbance
Land	Knoll	Small hill or mound within larger terrain	Local viewing and activity potential	Slope habitat and micro-topographic diversity	Interdependent	Erosion, construction, path widening
Land	Scarp	Steep escarpment or cliff at plateau edge	Panoramic views and waterfall origin	Slope habitat, rock exposure and drainage break	Interdependent	Edge construction, erosion, visual change
Land	Saddle	Low transition between higher points	Movement route, local views and drainage transition	Vegetation transition and drainage organisation	Interdependent	Road development and widening
Water	Shakkar Lake	Standing water body within hill landscape	Lake-edge recreation, scenery and stopping point	Water storage, local habitat and microclimatic influence	Interdependent	Waste, bank disturbance, runoff and siltation
Water	Kalapani Lake	Water body associated with surrounding	Scenic water attraction and landscape contrast	Aquatic/edge habitat and local water function	Interdependent	Litter, edge modification, drainage change

		vegetation				
Water	Streams	Linear flowing water connected to drainage	Seasonal scenic element and route feature	Drainage conveyance and vegetation support	Interdependent	Channel obstruction, pollution, erosion
Water	Waterfalls	Vertical or steep water movement over relief	Seasonal attraction and photographic destination	Hydrological expression of terrain and rainfall	Interdependent	Visitor concentration, erosion, upstream disturbance
Water	Cascades	Water descending over steep rocky surfaces	Seasonal scenery and microclimatic experience	Water movement, vegetation support and downstream contribution	Interdependent	Seasonal disturbance, litter, unsafe access
Water	Torrents	Temporary or permanent rapid flow on steep slopes	Dynamic seasonal landscape feature	Transfers runoff to downstream channels	Interdependent	Drainage modification and erosion
Water	Drainage network	Connected channels, depressions and runoff paths	Indirectly supports lakes, waterfalls and scenic vegetation	Catchment function and erosion control	Interdependent	Road crossings, blockage, construction runoff
Water	Seasonal pools / Bhimkund setting	Water held within rocky/gorge environment	Nature-based and culturally recognised attraction	Local aquatic habitat and hydrological storage	Interdependent	Crowding, waste, slippery/eroding access
Vegetation	Forest cover	Continuous or semi-continuous wooded landscape	Scenic enclosure, nature experience and destination identity	Habitat, soil protection, infiltration and microclimate	Interdependent	Clearance, fragmentation, fire and visitor disturbance
Vegetation	Forest edge	Transition between wooded land and roads/clearings	Approach scenery and edge viewpoints	Ecotone, habitat transition and slope protection	Interdependent	Road widening, informal parking, trampling
Vegetation	Seasonal vegetation	Vegetation expression varying with rainfall and season	Changes scenic character through the year	Soil cover, habitat and seasonal ecological function	Interdependent	Clearing, trampling and altered runoff
Vegetation	Riparian / drainage vegetation	Plants associated with water channels and moist depressions	Enhances water attractions and shaded experience	Bank stability, filtration and habitat	Interdependent	Channel clearing, litter and bank erosion
Vegetation	Slope vegetation	Plant cover on steep and bouldery terrain	Visual continuity across hillsides	Erosion control and habitat	Interdependent	Cut slopes, construction and path creation
Visual	View-shed	Visible landscape from major viewpoints	Primary resource for viewpoint tourism	Landscape character and perception of ecological	Interdependent	Buildings, signage, utilities and vegetation removal

				continuity		
Climate	Microclimatic variation	Local differences created by elevation, shade and vegetation	Comfort and distinctive hill-station experience	Supports vegetation and habitat variation	Interdependent	Vegetation loss and heat-retaining surfaces
Energy	Solar/wind potential	Supporting resource category identified in source framework	Potential support for lower-impact tourism services	Can reduce dependence on conventional supply if sensitively located	Context dependent	Visual intrusion and poorly sited infrastructure

The relationships between selected tourist locations and their associated natural features are summarised in Table 2.

Table 2. Tourist Locations and Their Landscape Dependencies

Tourist location	Primary natural setting	Tourism function	Landscape dependency	Principal sensitivity
Devi Point	Elevated ridge/plateau edge	Panoramic viewpoint	Long-distance view, steep edge and surrounding vegetation	View-shed obstruction, edge erosion, crowding
Hurricane / Hariken Point	Elevated hill edge	Panoramic viewpoint	Valley, forest and hill views	Construction, road pressure, visual clutter
Goraghat Point	Elevated terrain / valley edge	Scenic viewpoint	Relief contrast and borrowed landscape	Erosion, visitor pressure, edge modification
Monkey Point	Elevated landform	Viewpoint / stop	Topographic exposure and surrounding vegetation	Crowding, litter, vegetation disturbance
Panchbol Point	Gorge / elevated edge	Viewpoint and acoustic/scenic experience	Deep gorge, forest and distant views	Visitor concentration and edge disturbance
Prospect Point	Elevated ridge / plateau margin	Viewpoint	Panoramic exposure and scenic depth	Visual intrusion and road-side pressure
Thakur Point	Elevated terrain	Viewpoint	Ridge/valley relationship	Construction and visitor pressure
Mozari Point	Elevated terrain	Panoramic viewpoint	Wide landscape visibility	Visual clutter and edge development
Shakkar Lake	Lake and catchment	Water-based scenic attraction	Water surface, vegetation and terrain enclosure	Waste, bank pressure, drainage alteration
Kalapani Lake	Lake and vegetation	Water-based scenic attraction	Water-vegetation contrast	Litter, edge disturbance, runoff
Bhimkund	Gorge/water system	Water/landform attraction	Rock, water and seasonal hydrology	Crowding, erosion and waste
Gawilgarh Fort	Elevated heritage landscape	Heritage + panoramic tourism	Historic structure within hill/forest setting	Access pressure, insensitive

			construction, view change
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The principal pathways through which tourism-related activities may affect sensitive landscape features are summarised in Table 3.

Table 3. Pressure Pathways and Potential Landscape Effects

Pressure	Sensitive resource/interface	Mechanism	Potential effect	Planning response
Construction	Plateau edges, ridges, slopes, forest interfaces	Cut-and-fill, vegetation removal, new building mass	Erosion, habitat loss, altered drainage and visual intrusion	Slope controls; suitability zoning; design review
Road development	Ridges, saddles, slopes, drainage crossings	Widening, excavation, embankment and paving	Runoff concentration, fragmentation and visual change	Drainage-safe design; limit unnecessary widening
Vehicular movement	Viewpoints, road edges, tourist nodes	Traffic, parking and repeated edge occupation	Noise, compaction, congestion and informal expansion	Managed parking, drop-off and shuttle evaluation
Waste	Viewpoints, lakes, forest edges, water channels	Litter and unmanaged disposal	Scenic degradation, water contamination and wildlife interaction	Collection, segregation, removal and enforcement
Visitor trampling	Forest edges, slopes, water margins	Informal paths and repeated foot pressure	Soil compaction, erosion and vegetation loss	Defined trails, barriers and durable surfaces
Drainage disturbance	Roads, construction sites, lake catchments	Blockage, diversion and increased runoff	Erosion, siltation and changed seasonal flows	Protect channels; permeable surfaces; runoff controls
View-shed degradation	Major viewpoints and heritage setting	Buildings, signage, utilities and clutter	Reduced scenic quality and destination identity	View corridor mapping and design controls
Seasonal concentration	Waterfalls, cascades, holiday peaks	Short-period high visitor loads	Localised waste, crowding and path erosion	Seasonal staffing, maintenance and visitor management

2.3 Water Resources and Tourism

Water-based tourism in Chikhaldara is closely tied to terrain. Lakes occupy catchment positions, streams follow drainage lines, and waterfalls, cascades and torrents occur where runoff intersects steep slopes or scarps. This physical arrangement means that the attraction visible to a visitor is only one part of a connected hydrological system. The surrounding catchment, drainage crossings, surface cover and slope condition can influence how water moves through the landscape and how sediment or waste may be transferred downstream. The original study identifies these relationships descriptively, but it does not report discharge measurements, catchment boundaries or water-quality results. The implications should therefore be treated as a basis for planning and future investigation rather than as measured hydrological effects. (Department of Tourism,

Government of Maharashtra, n.d.; UN Tourism, 2023).

Seasonality adds another dimension to water-based attractions. During and after the monsoon, rainfall can increase visible flow and alter vegetation, runoff and access conditions; during drier periods, the same feature may present a different appearance or attract visitors for different reasons. Without repeated observations across seasons, it is not possible to determine the duration or magnitude of these changes for each site. A future assessment should document water features at comparable points in the monsoon, post-monsoon and dry seasons, while recording visible drainage obstruction, bank disturbance and litter. (UN Tourism, 2023).

2.4 Forests, Vegetation and Scenic Character

Forests, Vegetation and Scenic Character. Forests in the wider Melghat landscape perform ecological functions while also shaping the visual identity of Chikhaldara. Forest cover provides scenic enclosure along roads and around viewpoints, contributes to microclimatic differences, protects soil on slopes and supports habitat. Forest edges are particularly important because they are also where roads, parking, buildings and visitor movement may expand. The same edge can therefore be both a tourism asset and a disturbance interface. (Varghese & Yelisetty, 2006; Wagay et al., 2019; Government of Maharashtra, Forest Department, n.d.).

2.5 Tourism Development and Environmental Pressure

Tourism Development and Environmental Pressure. The source study identifies construction, road development, vehicular movement, waste, vegetation clearance, erosion and drainage disturbance as principal pressures. These are not presented as statistically measured impact magnitudes. Instead, they are observed or plausible pathways through which tourism-related activity can alter the landscape systems supporting attractions. This distinction is important for research integrity: the study can identify relationships and management priorities without claiming quantified causation. (Štrba et al., 2022; UN Tourism, 2023; Geneletti & Dawa, 2009; Sundriyal et al., 2018; United Nations Environment Programme & World Tourism Organization, 2005).

2.6 Landscape Planning, Regulation and Sustainability

Landscape Planning, Regulation and Sustainability. The source manuscript refers to the Sustainable Tourism Plan for Maharashtra and the Unified Development Control and Promotion Regulations for Maharashtra State as planning context. Together, such documents establish that tourism development must be considered within wider development-control, infrastructure and environmental-management systems. For Chikhaldara, this implies that tourism planning cannot be separated from slope safety, drainage, forest context, visual character and settlement growth. (Government of Maharashtra, 2025; Dalal Mott MacDonald, 2003; Global Sustainable Tourism Council, 2019; Government of India, Ministry of Environment and Forests, 2006; Government of Maharashtra, Directorate of Tourism, 2025; Maharashtra Metropolitan Region Development Authority, n.d.; Ministry of Tourism, Government of India, 2002; Sood et al., 2024).

A recurring weakness in destination planning is the treatment of attractions as points rather than systems. A point-based approach may provide facilities immediately around a viewpoint while overlooking the ridge that supports it, the road that concentrates runoff toward it, or the view corridor that gives it meaning. A system-based approach instead asks which landscape components enable the attraction and which off-site changes could undermine it. (UN Tourism, 2023; UN Tourism, n.d.).

2.7 Research Gap

Research Gap. Existing material provides useful information on Chikhaldara's tourism attractions, forest resources, ecological context and development potential, but comparatively less attention is given to the spatial relationship between natural-resource structure and the location of tourist points. The source study addresses this gap descriptively. The expanded paper strengthens that contribution by formalising a resource–tourism–pressure framework, separating evidence from inference, and translating the findings into a monitoring agenda (Sood et al., 2024; Varghese & Natori, 2024).

2.8 Contribution of the Study

Contribution of the Study. The contribution is threefold. First, it interprets landform, water and vegetation as the enabling structure of tourism rather than as background scenery. Second, it shows that tourism pressures are concentrated at the same interfaces that generate visitor value, including plateau edges, water margins, forest edges and access routes. Third, it proposes a planning sequence in which resource sensitivity is mapped before additional infrastructure is located. These contributions remain qualitative and are intended to guide future GIS and field validation.

Methodology

The study area comprises Chikhaldara Hill Station and its immediate tourism landscape in Amravati district, Maharashtra. The Google Earth-based map prepared in the original study plots selected tourist points and natural features in relation to the settlement and road network. The map is used here as a qualitative spatial reference; it is not treated as a georeferenced GIS dataset and no exact distances are derived from it. (Department of Tourism, Government of Maharashtra, n.d.). The spatial distribution of selected tourist locations and natural features is shown in Figure 1.

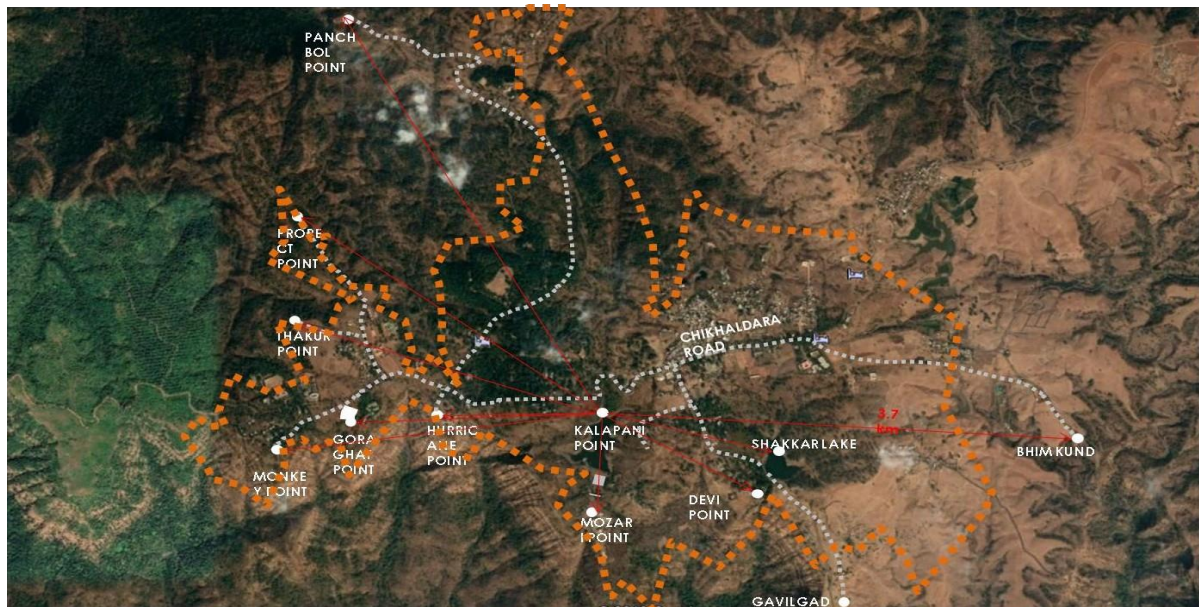


Figure 1. Location of selected tourist points and natural features in Chikhaldara, reproduced from the original study.

The mapped pattern supports three broad observations. First, multiple viewpoints occur around elevated edges rather than within a single central tourism precinct. Second, water attractions occupy distinct positions associated with local drainage and depressions. Third, the settlement and road network provide access to a dispersed landscape of attractions, creating repeated interfaces between mobility infrastructure and sensitive terrain. (Department of Tourism, Government of Maharashtra, n.d.).

The conceptual framework treats natural-resource structure as the base layer that produces ecological

functions and tourism opportunities. Tourist use then concentrates movement and infrastructure at selected landscape nodes. Where the intensity or form of use exceeds the sensitivity of the resource system, pressure is expressed through erosion, vegetation disturbance, drainage change, waste or visual intrusion. Planning responses should therefore operate at the resource-system scale rather than only at the attraction boundary. The conceptual framework linking natural resources, tourism opportunities, environmental pressures and management responses is presented in Figure 2.

Resource–Tourism–Pressure Framework



Figure 2. Conceptual resource–tourism–pressure framework developed from the original study.

3.1 Analytical propositions

Viewpoint tourism depends on the integrity of wider ridge, plateau-edge and view-shed systems. Water attractions depend on catchment and drainage continuity rather than only on the visible water body. Vegetation performs tourism and ecological functions simultaneously; vegetation loss can therefore produce multiple impacts. Tourism pressure is most consequential where visitor concentration overlaps sensitive slopes, water margins, forest edges and visually prominent landforms. Landscape-sensitive planning should protect the enabling resource system before adding infrastructure.

3.2 Research Design

This qualitative case study examines the relationship between natural-resource structure and selected tourist locations in Chikhaldara. It draws on documentary sources, Google Earth imagery, field observations and photographic records. The analysis is descriptive: it compares the physical setting of tourist locations with the landscape functions and pressures discussed in the source material. It does not estimate statistical effects. (UN Tourism, 2023).

3.3 Documentary Evidence and Source Selection

Documentary evidence in the source study includes government reports, tourism and planning documents, forest-related material and academic studies relevant to Chikhaldara and the wider Melghat region. Sources were used when they contributed information on natural resources, tourist locations, ecological functions, development pressure or planning context. The evidence was organised around four principal resource groups - land, water, vegetation and energy - and then compared with tourist-site locations and observed pressure pathways. (Dalal Mott MacDonald, 2003; Government of Maharashtra, 2025; Varghese & Yelisetty, 2006; Wagay et al., 2019).

3.4 Field Observation

Field observation was used to record visible site character and pressure rather than to produce instrument-based measurements. Attention was given to landform, vegetation, water, visitor activity, roads, tourism infrastructure, waste, erosion and construction. Because the source paper does not document a repeated seasonal protocol or structured observation sheet, the observations are treated as qualitative and illustrative.

3.5 Photographic Documentation

Photographs provide the strongest direct visual evidence in the original manuscript. Representative images document hills, valleys, gorges, knolls, scarps, saddles and cascades. In this expanded paper, the photographs are retained within the results section where each feature is interpreted in relation to tourism function, ecological role and pressure, rather than being detached as an appendix.

3.6 Google Earth-Based Interpretation (Google, n.d.).

Google Earth imagery was used in the source study to locate selected tourist points relative to the hill station and surrounding landscape. The method supports visual comparison of attraction distribution with broad terrain and settlement patterns. However, it does not substitute for GIS: coordinates, digital elevation models, slope classes, buffers, network analysis and view-shed calculations are not reported. The present paper therefore uses the map only for descriptive spatial interpretation.

3.7 Analytical Procedure

The material was organised by classifying the principal resource groups, identifying named tourist locations, interpreting their broad spatial setting from the available Google Earth map, and comparing photographs and observations with the documented tourism and environmental context. The resulting synthesis links each landscape feature to its tourism role, ecological function and potential pressure. This is a conceptual coding exercise rather than a numerical scoring model.

3.8 Evidence Coding

For clarity, evidence is interpreted through three coding dimensions. Resource code identifies the enabling landscape system (landform, water, vegetation or supporting environmental condition). Tourism-function code identifies the principal visitor role (viewpoint, water attraction, heritage setting, route experience or scenic support). Pressure code identifies the principal disturbance pathway (construction, road development, vehicles, waste, trampling, erosion, drainage alteration or visual intrusion). This coding is conceptual and does not imply numerical weighting.

3.9 Validity and Research Integrity

The interpretation draws on several forms of material, including documentary descriptions, the location map, photographs and field observations. These sources provide complementary views of the landscape, but their limits are important. The available manuscript does not document interviews, questionnaires, visitor

counts, repeated seasonal observations, ecological sampling or GIS-derived measurements. The findings should consequently be read as qualitative relationships and planning considerations, not as measured causal effects. (UN Tourism, 2023).

4. Results

The results are presented as a comparison of landscape features, tourist locations and the pressures associated with their use. Tables 1–3 summarise the resource inventory, tourist-location dependencies and potential pressure pathways, while Tables 4 and 5

organise the photographic interpretations. Figures 1–3 provide the location map and conceptual framework, and Figure 4 presents the source-derived analytical chart. The photographs and location map help illustrate the physical setting, while the tables summarise the relationships described in the source material. (Department of Tourism, Government of Maharashtra, n.d.; Štrba et al., 2022). Figures 1–3 provide the location context and conceptual framework, while Figure 4 presents the source-derived analytical chart.

The photographic matrix demonstrates that the physical structure of Chikhaldara is not merely scenic background. Each landform supports a combination of tourism and ecological functions, and each is exposed to a characteristic set of pressures. Table 4 presents a photographic interpretation of hills, valleys, gorges and knolls, highlighting their tourism functions, ecological roles and potential pressures.

Table 4. Photographic interpretation of hills, valleys, gorges and knolls using the original source images.

3	Photograph	Tourism role	Ecological role	Pressure
Hills		Scenic views, tourist points, borrowed views and microclimatic variation.	Habitat and microclimatic variation.	Construction and visitor pressure.
Valleys		Scenic depth, tourist points, borrowed views and vegetation variation.	Drainage corridor and habitat.	Development and drainage alteration.
Gorges		Waterfall/stream setting and dramatic scenic views.	Water movement and habitat.	Erosion and visitor disturbance.
Knolls		Local viewing/activity potential and landscape variety.	Slope and habitat function.	Erosion and construction.

The first four landform types demonstrate a progression from broad elevated terrain to more confined valley and gorge systems. Tourism use responds to this morphology: hills and knolls offer exposure and local views, whereas valleys and gorges generate depth, enclosure and water-related scenery. Ecologically, the same features organise drainage, habitat and microclimatic variation.

4.2 Scarps, Saddles and Cascades

Table 5 extends the photographic interpretation to scarps, saddles and cascades, emphasising their tourism and ecological functions and associated pressures.

Table 5. Photographic interpretation of scarps, saddles and cascades using the original source images.

Feature	Photograph	Tourism role	Ecological role	Pressure
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Scarps		Waterfall origin, panoramic views and dramatic plateau edges.	Slope/habitat function.	Erosion and construction.
Plateau-edge scarps		Scenic views, borrowed views, vegetation and microclimatic variation.	Slope/habitat function.	Road development and edge disturbance.
Saddles		Movement, stream origin/transition and vegetation variation.	Drainage and vegetation transition.	Road development.
Cascades		Seasonal water scenery, streams, microclimate and vegetation variation.	Water movement and vegetation support.	Seasonal disturbance and visitor pressure.

Scarps are especially important because they combine visual prominence, slope sensitivity and hydrological expression. Water may emerge or descend along steep edges, while viewpoints use the same edges for panoramic exposure. Saddles act as transitions between higher terrain and can attract routes because of their comparatively accessible geometry. Cascades demonstrate the direct interaction of relief, water and vegetation. (Varghese & Yelisetty, 2006).

4.3 Viewpoints and Elevated Landforms

The strongest recurring pattern is the association of viewpoints with elevated landforms. Devi Point, Hurricane Point, Goraghat Point, Monkey Point, Panchbol Point, Prospect Point, Thakur Point and Mozari Point are linked to ridges, plateau edges or other elevated terrain. Their tourism function is generated by elevation, edge condition and visibility rather than by the viewing platform alone. (Department of Tourism, Government of Maharashtra, n.d.).

This relationship can be expressed as a dependency chain: elevated landform creates topographic exposure; exposure produces a view-shed; the view-shed produces scenic tourism value; access infrastructure concentrates visitors at the edge; and visitor concentration can then generate pressure on the same landform. The tourism asset and the sensitive resource are therefore spatially coincident.

4.4 View-shed as a Natural-Tourism Resource

Although a view-shed is not a material resource in the same sense as soil or water, it is a functional landscape resource for tourism. Its quality depends on the continuity of foreground, middle-ground and distant scenery. Buildings, billboards, utilities, road-edge structures and excessive clearing can alter the perceived landscape even without physically

occupying the viewpoint itself. (UN Tourism, 2023).

The source study's emphasis on protecting view-sheds is therefore justified by the distribution of viewpoint tourism. Future GIS work should delineate visible areas from major viewpoints and identify visually sensitive ridges, valley walls and approach corridors. Until such analysis is completed, planning decisions should apply precaution to visually prominent plateau margins.

4.5 Terrain Sensitivity

Steep terrain increases the importance of development form. Cut-and-fill, retaining walls, road widening and informal footpaths can expose soil and concentrate runoff. Where such interventions occur on scenic edges, physical disturbance and visual impact can occur simultaneously. This dual sensitivity is a defining characteristic of Chikhaldara's tourism landscape. (Štrba et al., 2022; UN Tourism, 2023).

4.6 Water-Based Attractions and Drainage Relationships

Shakkar Lake, Kalapani Lake, Bhimkund, cascades, torrents and seasonal waterfall settings illustrate the relationship between tourism and hydrology. Lakes provide relatively stable water surfaces, while cascades and torrents express seasonal runoff over steep terrain. Bhimkund combines rock, gorge and water characteristics. These attractions differ in form but share dependence on catchment condition and drainage continuity.

The source evidence does not provide discharge measurements, catchment boundaries or water-quality data. Nevertheless, the physical relationships are sufficient to identify management pathways. Increased impervious surface can increase runoff; disturbed slopes can increase sediment; blocked channels can alter flow; and waste deposited near

water can reduce scenic and ecological quality. These pathways justify watershed-oriented planning even before quantitative hydrological modelling is available. (UN Tourism, 2023).

4.7 Seasonal Dependence

Seasonality is a major unresolved variable. Monsoon rainfall can increase waterfall and cascade visibility, vegetation density and surface runoff, while dry-season conditions may reduce flow and expose different patterns of visitor use. The original study acknowledges that seasonality is not fully represented. Future research should therefore repeat observations across monsoon, post-monsoon and dry periods rather than extrapolating from a single observation window.

4.8 Water Margins as Visitor Interfaces

Water margins are likely to concentrate stopping, photography, informal seating and food-related activity. This makes them vulnerable to trampling, litter and edge modification. Management should distinguish between durable visitor-access areas and ecologically sensitive margins, concentrating facilities where disturbance can be controlled.

4.9 Forest and Vegetation Relationships

Forests contribute to Chikhaldara's tourism experience at multiple scales. At the regional scale they establish the destination's wooded hill character; at the route scale they frame roads and approaches; and at the site scale they provide shade, enclosure and scenic foreground. Ecologically, vegetation supports habitat, protects soil, influences infiltration and moderates local microclimate. (Varghese & Yelisetty, 2006; Wagay et al., 2019).

The overlap between tourism and forest edges is important. Roads and viewpoints often occur where open and wooded areas meet. Such edges can become expansion zones for parking, stalls, widening and informal paths. Repeated small interventions may gradually convert a vegetated edge into a fragmented

service strip. This cumulative process is not captured by attraction-by-attraction planning.

4.10 Gawilgarh Fort as a Heritage-Landscape Relationship

Gawilgarh Fort differs from the natural viewpoints because it is a built heritage attraction, yet its tourism value is still reinforced by natural setting. Its elevated position, rugged access and panoramic forested context create a combined heritage-landscape experience. The result demonstrates that natural-resource planning is relevant even for cultural attractions when landscape setting is part of the visitor experience.

4.11 Combined Resource Functions

The findings show that most features perform more than one function. A scarp may be a viewpoint edge, waterfall origin, habitat surface and visual landmark. A valley may be a drainage corridor, scenic foreground and vegetation zone. A lake may be a tourism destination, water body and microclimatic element. This multifunctionality is the central reason that tourism planning should be integrated with landscape planning.

4.12 Source Analytical Chart

The original paper includes an analytical chart comparing tourist-point associations with natural features, pressure severity and ecological/tourism-use scores. The chart is reproduced because it is part of the source evidence. However, the original methodology does not document a reproducible scoring protocol, sample size, weighting system or statistical procedure for all values. It should therefore be read as an exploratory descriptive synthesis rather than as validated quantitative measurement. The source study's comparative assessment of tourist-point associations, environmental pressures and ecological/tourism-use scores is presented in Figure 3.

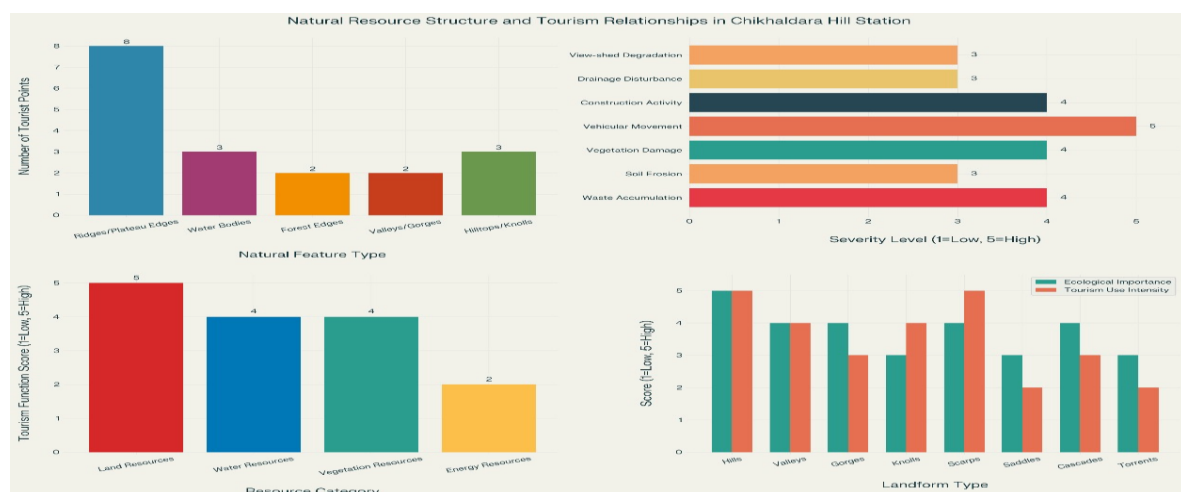


Figure 3. Analytical chart reproduced from the original study. Numerical values are retained as source-derived descriptive material and are not treated as statistically validated results.

Despite this limitation, the chart is useful in showing the study's intended analytical logic: natural features are linked to tourism functions, pressures are differentiated by perceived severity, and ecological and tourism uses are considered together. A future study could convert this logic into a transparent index by defining variables, measurement units, scoring rules and repeated observations.

5. Discussion

The central finding is that Chikhaldara's tourism value and environmental sensitivity often occur in the same locations. Elevated edges provide panoramic views but are vulnerable to erosion and visual intrusion, while water margins attract visitors but may be affected by litter, trampling, and disturbance of the banks. Similarly, forest edges frame tourist routes and viewpoints but can become convenient locations for parking and incremental construction. These overlaps highlight the need for planning at the scale of connected landscape systems rather than treating each tourist attraction as an isolated site. (Štrba et al., 2022; UN Tourism, 2023).

The results support a shift from attraction-based planning towards landscape-system planning. Chikhaldara's ridges, scarps, valleys, drainage systems, and forests function as forms of tourism infrastructure even though they are not constructed facilities. These natural features create panoramic views, access routes, local microclimates, water-based attractions, and the scenic identity of the destination. Degradation of these systems can therefore diminish destination quality in much the same way that deterioration of built infrastructure can reduce service quality. This perspective changes the sequence of planning decisions. Rather than locating a tourism project first and attempting to mitigate its environmental effects afterwards, planners should initially identify the relevant resource systems, their environmental sensitivity, and their tourism functions. Infrastructure can then be located and designed to support accessibility and visitor needs without undermining the natural resources that make the destination attractive. (Government of Maharashtra, 2025; UN Tourism, 2023).

Tourism value and environmental vulnerability are concentrated in many of the same locations. Plateau edges are valued for their panoramic views but are vulnerable because of their steep terrain and visual prominence. Water margins attract visitors through opportunities for contact with water and scenic appreciation, yet they may be susceptible to littering, trampling, and bank disturbance. Forest edges contribute to the visual richness of the landscape but

can be affected by incremental vegetation clearance. This spatial overlap helps explain why generic development standards may be insufficient for environmentally sensitive tourist landscapes. Planning measures need to account for the specific characteristics and vulnerabilities of individual landscape features while also considering their relationships with surrounding areas.

An important implication of the landscape-system perspective is that environmental and visual impacts may originate beyond the boundaries of an individual attraction. Buildings located outside a viewpoint can obstruct important sightlines, while road works on higher slopes may alter runoff patterns and affect water bodies located downslope. Similarly, vegetation clearance beyond a tourist platform can change the scenic character of the surrounding landscape, and parking expansion along approach roads can contribute to the fragmentation of forest edges. These relationships indicate that planning boundaries should, wherever possible, reflect functional landscape connections rather than being restricted to the immediate area designated as a tourist attraction.

The pressure pathways identified in the study may develop cumulatively through a sequence of interconnected activities. Tourism-related construction often requires road access, which can increase vehicle movement and generate additional parking demand. Parking expansion may create larger disturbed surfaces, potentially increasing runoff and erosion, while associated commercial and service activities may contribute to additional waste generation. Although each intervention may appear relatively small when considered individually, its combined effects with other developments may progressively alter sensitive landscape features such as ridges, forest edges, and water margins. Consequently, environmental management should consider not only the direct effects of individual projects but also the cumulative pressures arising from successive infrastructure developments and visitor-related activities. (Štrba et al., 2022).

Chikhaldara's tourism identity depends not only on its named attractions but also on the continuity of the landscape experienced while travelling between them. Roads, forested slopes, valley openings, scarps, and distant ridges collectively create a sequence of visual and spatial experiences that contributes to the destination's distinctiveness. If development fragments this sequence through visually dominant structures, extensive vegetation clearance, or poorly integrated infrastructure, the destination may lose

some of the landscape qualities that distinguish it from a more urbanised hill settlement. Maintaining landscape continuity is therefore an important consideration in tourism planning, particularly where the scenic character of the surrounding environment forms a central part of the visitor experience.

Although the study identifies plausible and observed relationships between natural resources, tourism activities, and environmental pressures, it does not establish their causal magnitude. For example, the presence of erosion near a tourist site does not, by itself, quantify the respective contributions of visitor activity, road development, rainfall, or construction. Similarly, the spatial association between a viewpoint and a ridge does not statistically establish that the ridge's characteristics caused the viewpoint's location or selection. The findings should therefore be interpreted qualitatively, as they identify planning-relevant dependencies and potential risk pathways that warrant further investigation through systematic field measurements, quantitative spatial analysis, and longitudinal monitoring.

The credibility of the analysis is strengthened where different forms of evidence converge. Tourist descriptions help identify viewpoints and water-based attractions, the Google Earth-derived location map illustrates their spatial distribution, photographs document representative landforms, and field observations identify visible categories of environmental pressure. Although none of these sources provides a complete assessment independently, their combined use supports a coherent interpretation of Chikhaldara as an interconnected landscape system. This triangulation provides a useful basis for identifying planning concerns while recognising that more systematic spatial and environmental data would be required to quantify the extent, intensity, and causes of the pressures identified. (Department of Tourism, Government of Maharashtra, n.d.; UN Tourism, 2023).

6. Conclusion

This study examined the relationships between natural resources, landscape characteristics, tourism opportunities, and environmental pressures in Chikhaldara Hill Station, Maharashtra. The findings highlight the importance of understanding Chikhaldara as an interconnected landscape system in which landforms, water resources, vegetation, and climatic conditions collectively contribute to the destination's tourism value. Features such as ridges,

plateau edges, scarps, valleys, lakes, drainage channels, and forested slopes provide scenic experiences and shape the spatial character of tourist activities. These natural resources therefore function as an integral component of tourism infrastructure, supporting the attractiveness and distinctiveness of the destination.

The analysis further indicates that tourism value and environmental sensitivity frequently overlap. Locations that attract visitors because of their panoramic views, water features, and scenic surroundings may also be vulnerable to erosion, vegetation disturbance, littering, drainage alteration, and visually intrusive development. These pressures may extend beyond individual tourist attractions and accumulate through interconnected activities such as road construction, parking expansion, vegetation clearance, and the development of visitor facilities. Consequently, planning decisions based solely on individual attractions may overlook the broader landscape relationships through which environmental changes influence tourism quality.

The study emphasises the need to move from attraction-centred planning towards a landscape-sensitive approach that recognises the functional connections between natural resources, tourism infrastructure, and environmental pressures. Identifying sensitive landforms, protecting vegetation and water margins, managing visitor movement, and locating infrastructure in accordance with landscape characteristics can help support tourism development while maintaining the environmental and scenic qualities of the destination. The integration of landscape considerations into tourism planning can also provide a basis for coordinating infrastructure development and environmental management across connected areas.

Overall, the study provides a qualitative framework for interpreting the relationship between natural resource structure and tourism-landscape interactions in Chikhaldara. By highlighting the coexistence of tourism opportunities and environmental vulnerabilities, it establishes a conceptual basis for more systematic landscape assessment and sustainable destination planning. The findings can inform future investigations involving spatial mapping, environmental monitoring, visitor-use assessment, and the evaluation of tourism-related pressures. Such work would help strengthen the empirical basis for planning decisions and support the long-term conservation of Chikhaldara's distinctive hill-station landscape

7. Limitations

This study adopts a qualitative, landscape-system approach to examine the relationships between natural resources, tourism opportunities, and environmental pressures in Chikhaldara Hill Station. Its findings are based on documentary sources, Google Earth-based spatial interpretation, photographs, and field observations. Although these sources support a contextual understanding of the landscape and its tourism functions, the study does not include a formal GIS-based terrain analysis, systematic spatial measurements, or quantitative modelling of relationships between landscape characteristics and tourism activity.

The study also does not incorporate comprehensive visitor counts, structured surveys of tourists or local communities, or systematic seasonal observations. Consequently, it cannot quantify visitor pressure, establish seasonal variations in tourism-related impacts, or determine the relative importance of different environmental pressures. Similarly, observations concerning erosion, drainage alteration, vegetation disturbance, littering, and visual intrusion are interpreted as potential or visible pressure pathways rather than as quantitatively verified impacts attributable exclusively to tourism.

Furthermore, the study does not establish causal relationships between specific tourism activities and environmental changes. For example, erosion observed near a tourist location may be influenced by several interacting factors, including rainfall, slope characteristics, road development, construction, and visitor movement. Without longitudinal observations and appropriate environmental measurements, the contribution of each factor cannot be determined reliably. The conceptual relationships presented in the study should therefore be understood as planning-oriented interpretations rather than statistically validated causal models.

Finally, the findings are specific to the landscape and tourism context of Chikhaldara Hill Station and should not be generalised directly to other hill stations without considering their geographical, ecological, infrastructural, and tourism characteristics. Future research could address these limitations through GIS-based landscape mapping, seasonal field surveys, visitor-flow analysis, water and soil assessments, and consultations with relevant stakeholders. Such approaches would enable more precise evaluation of environmental sensitivity, tourism-related pressures, and the effectiveness of landscape-sensitive planning interventions. (UN Tourism, 2023).

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10. Author Declaration

The authors declare that this manuscript is original and has not been published elsewhere. The authors declare no conflicts of interest.