Multidimensional Assessment of Tourism Impacts in the Semi-Arid Ecosystem of Dandoba Hills, Sangli District, Maharashtra, India.

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Abstract.

Tourism has emerged as a significant activity influencing both economic development and environmental conditions in many natural landscapes. However, tourism development in ecologically sensitive regions can generate both positive and negative impacts. The present study examines the multidimensional impacts of tourism in the semi-arid ecosystem of Dandoba Hills, located in Sangli district of Maharashtra, India. The region represents a dryland ecosystem characterised by tropical dry deciduous vegetation, scrub communities and seasonal herbaceous flora. Increasing tourism activities such as trekking, religious visits, and recreational outings have gradually influenced ecological and socio-economic conditions in the area. This study evaluates tourism impacts using an integrated framework covering ecological, environmental, socio-economic, and cultural dimensions. Data were collected through field observations, vegetation assessments, tourist interactions, and secondary sources. The findings indicate that tourism contributes to local income generation and enhances awareness about natural heritage; however, unregulated visitor activities lead to vegetation disturbance, soil erosion, waste accumulation and wildlife habitat disturbance. The study emphasizes the need for effective sustainable tourism management practices including visitor regulation, environmental education, and participation of local communities. Implementing such measures can help maintain ecological balance while supporting tourism development in semi-arid ecosystems.

Keywords : Tourism impacts, semi-arid ecosystem, biodiversity conservation, sustainable tourism, Dandoba Hills.

Introduction

Tourism is one of the fastest-growing sectors globally and plays a vital role in regional economic development. Natural landscapes with unique ecological characteristics attract a large number of visitors seeking recreation, adventures, and cultural experiences. Although tourism provides economic benefits and employment opportunities, unplanned and excessive tourism activities may create environmental stress, particularly in fragile ecosystems. Semi-arid ecosystems are highly sensitive to human disturbance because of their limited water availability, fragile soil structure and slow vegetation recovery rates. Even small changes in land use or visitor pressure may influence plant communities, soil conditions, and wildlife habitats. Dandoba Hills situated in the Sangli District of Maharashtra, represents and important semi-arid ecological landscape. The area supports tropical dry deciduous forests, scrub vegetation and seasonal grasses, typical of dryland environments. In recent years, The hills have gained popularity among tourists due to trekking routes, scenic viewpoints and the presence of religious sites such as Dandoba temple. The increase in tourism has brought both opportunities and challenges to the region. While tourism may provide economic benefits and encourage environmental awareness, It can also lead to ecological degradation if visitor activities remain unregulated. Therefore, assessing tourism impacts from multiple perspectives is essential for ensuring sustainable management of the region. The present research focuses on evaluating tourism

impact in Dandoba Hills, using a multidimensional approach that examines ecological environmental, socio-economic and cultural aspects.

Objectives of the study

The major objectives of the study are as follows:

1. To examine the ecological characteristics of the semi-arid ecosystem of Dandoba Hills.
2. To evaluate tourism impacts from ecological environmental, socio-economic, and cultural perspectives.
3. To identify both beneficial and adverse effects of tourism activities in the study area.
4. To propose sustainable management strategies for responsible tourism development.

Study Area

Dandoba Hills are located in the Sangli district of Southern Maharashtra and form part of the Mahadev hill range. The Hills lie approximately 20-25 kilometers from Sangli city and are accessible from nearby towns, such as Miraj and Kavathe Mahankal. The landscape is characterised by rocky slopes, undulating terrain, and plateau-like structures that are typical of semi-arid regions. Climatic conditions include moderate to low rainfall, high summer temperatures and extended dry periods during most of the year. The vegetation of the region mainly consists of tropical dry deciduous species along with the scrub plants, grasses and seasonal vegetation. These plant communities play an important ecological role in maintaining soil stability and supporting biodiversity. Apart from ecological importance, The hills also hold cultural and religious significance because of temples and pilgrimage activities that attract visitors throughout the year. Tourism activities such as trekking, nature walks, photography and religious visits have increased steadily over the past few years.

Materials and Methods

1. Research Design.

The present study adopts a descriptive and interdisciplinary research approach to assess tourism impacts in the Dandoba Hills ecosystem. A Multidimensional analytical framework was used to evaluate different aspects of tourism influence including ecological, environmental, socio-economic, and cultural impacts.

2. Data Collection.

I) Primary Data

Primary information was obtained through several field based methods conducted during multiple visits to the study area.

A) Field Observations:

Direct observations were carried out to examine tourist activities, vegetation disturbances, soil erosion, and waste disposal patterns in different parts of the hills.

B)Vegetation Assessment:

Basic vegetation observations were conducted along trekking routes and surrounding natural areas to identify possible ecological disturbances caused by human movement.

C) Tourist Interaction:

Informal discussions with visitors and local residents helped in understanding tourism patterns, frequency of visits, and awareness regarding environmental conservation.

D) Photographic Documentation:

Photographs were recorded during field surveys to document ecological conditions, tourist behavior and environmental changes.

II) Secondary Data

Secondary information was collected from various academic and institutional sources including:

1. Scientific research articles
2. Government reports
3. Forest department, Publications
4. Tourism department records
5. Books related to ecology and tourism studies

Analytical Framework

Tourism impacts were evaluated under four major dimensions:

Dimension	Indicators
Ecological	Vegetation, disturbance, biodiversity pressure
Socio-economic	Employment opportunities, income generation
Cultural	Religious tourism, cultural interaction

Data Analysis

The collected data was analyzed using qualitative and descriptive methods. Observed tourism impacts were categorized into ecological environmental, socio-economic and cultural dimensions observations were interpreted to identify both positive and negative impacts supported by tables and graphical representations.

Results and Discussion

1. Ecological Impacts

Tourism activities have noticeable effects on vegetation and wildlife habitats. Field observations indicate that vegetation trampling occurs along frequently used trekking routes leading to reduced the plant cover. Soil erosion was observed on steep slopes due to continuous human movement. These findings indicate that unregulated, tourism can disturb ecological balance.

Impact	Observation
1. Vegetation, trampling	1. Occurs along trekking routes
2. Habitat disturbance	2. Bird and small animal movement affected
3. Soil erosion	3. Visible on frequently used pathways

Vegetation damage is mainly associated with uncontrolled movement of visitors outside designated trails.

2. Environmental Impacts

Environmental changes linked with tourism were observed in several parts of the hills. Environmental issues such as plastic waste, soil compaction, and noise disturbance were observed in tourist areas. Accumulation of non-biodegradable Waste affects soil quality and aesthetic value of the landscape. These impacts highlight the need for proper Waste management systems.

Environmental Issues:

Environmental Issue	Observation
1. Plastic waste	1. Food wrappers and bottles found
2. Soil compaction	2. Due to frequent walking
3. Noise disturbance	3. During peak tourism periods

Such environmental pressures may gradually influence the natural quality of the ecosystem.

3. Socio Economic Impacts

Tourism has generated certain economic benefits for local communities living near the hills.Tourism contributes positively to local livelihoods by creating employment opportunities and supporting small businesses. However, income generated from tourism is often seasonal and unevenly distributed among local communities.

Socio-economic effects:

Positive effects	Negative effects
1. Local employment opportunities	1. Seasonal income fluctuations
2. Growth of small business	2. Unequal benefit distribution
3. Increase tourism awareness	3. Dependency on tourism income

4. Cultural Impacts

Religious tourism associated with the Dandoba temple plays an important role in preserving cultural traditions.However, overcrowding during festivals and commercialization of cultural practices were also observed.

Cultural Effects:

Positive	Negative
1. Preservation of religious Heritage	1. Overcrowding during festivals
2. Cultural exchange	2. Commercialization of traditions

5. Major Tourism Activities Observed in Dandoba Hills:

Tourism activity	Description
1. Trekking	1. Preferred by youth and adventure tourists
2. Religious tourism	2. Pilgrimage visits to the Dandoba Temple
3. Nature photography	3. Attractive, natural landscapes, encourage photography
4. Picnic and recreation	4. Common among families and local tourists

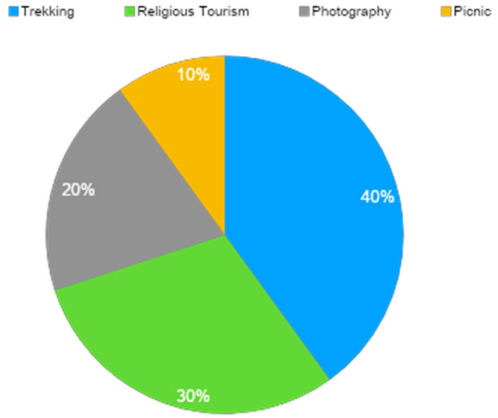
Tourism in the Dandoba Hills region largely consists of recreational and pilgrimage related activities. The natural scenery, trekking trails, and the presence of the Dandoba temple attract a considerable number of visitors.Trekking is especially favoured by young people and adventure seekers, whereas religious tourism mainly involves pilgrims visiting the temple located in the hills. In addition, activities such as nature photography and family picnics are frequently observed in the area.

Although these tourism activities support local tourism development and increase visitor interest in the region's growing number of tourists may also exert pressure on the natural environment. continous human movement can result in impacts such as trampling of vegetation, soil compaction or erosion,and accumulation of waste in certain locations.

6. Types of Tourist Activities in Dandoba Hills:

Activity	Percentage
1. Trekking	40%
2. Religious tourism	30%
3. Photography	20%
4. Picnic	10%

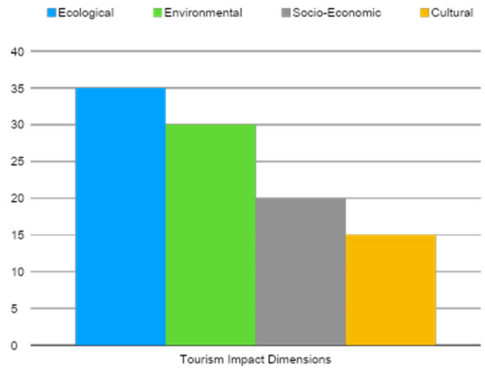
Tourism in the Dandoba Hills region is primarily characterised by recreational and religious activities. The natural landscape, trekking routes, and the presence of the Dandoba temple attract a considerable number of visitors throughout the year



Tourist Activities in Dandoba Hills

Distribution of Tourism Impact Dimensions

Tourism Impact Dimensions	Percentage
Ecological	35%
Environmental	30%
Socio-economic	20%
cultural	15%



Relative distribution of tourism, impacts across ecological environmental, social, economic, and cultural dimensions.

Sustainable Tourism Management Strategies

To minimise environmental degradation and support responsible tourism, the following measures are suggested

1. Development of designated trekking routes to protect vegetation.
2. Implementation of effective waste management systems.
3. Promotion of ecotourism and environmental awareness programmes.
4. Involvement of local communities in tourism planning and management.
5. Regulation of visitor numbers during peak tourism seasons.

Conclusion

Dandoba Hills represent a valuable semi-arid ecosystem with ecological, cultural and recreational significance. The increasing popularity of the area as a tourism destination has created economic opportunities for local communities while also introducing environmental pressures. The study demonstrates that tourism impacts in the region occur across multiple dimensions including ecological disturbance, environmental changes, socio-economic benefits, and cultural influences. Proper planning and sustainable management strategies are necessary to balance tourism development with ecological conservation. Promoting responsible tourism practices, improving visitor awareness and encouraging community participation can help maintain the long-term ecological stability of the Dandoba hills ecosystem.

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