"ENVIRONMENTAL IMPACTS OF ECOTOURISM -A CASE STUDY ON RANGANATHITTU BIRD SANCTUARY, KARNATAKA"

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Abstract : Eco-tourism has emerged as an important tool for conservation and sustainable livelihood development in Karnataka, especially in biodiversity-rich regions. This descriptive research focuses on the environmental impacts of eco-tourism in the Ranganathittu Bird Sanctuary**,** one of India's most significant wetland ecosystems and a major habitat for resident and migratory bird species. The study aims to analyse how tourism activities influence the ecological balance, habitat quality, and wildlife behaviour within the sanctuary. Using a descriptive case-study approach, the research examines both positive and negative environmental impacts**.** On the positive side, eco-tourism has generated revenue for habitat protection, enhanced public awareness about bird conservation, supported community involvement in conservation programmes, and encouraged infrastructure improvements that follow eco-friendly guidelines. However, the study also identifies several adverse effects such as disturbance to nesting birds due to boating and tourist noise**,** increased solid waste generation, shoreline erosion, pollution from motorboat operations, and trampling of vegetation in high-footfall areas. Seasonal tourist pressures, especially during migratory months, further intensify ecological stress.

Keywords:
Eco-tourism, Environmental Impact, Ranganathittu Bird Sanctuary, Wetland Ecosystem, Biodiversity Conservation, Sustainable Tourism, Habitat Disturbance, Migratory Birds, Wildlife Management, Karnataka Tourism.

Introduction:

Eco-tourism has gained significant importance in recent decades as a sustainable alternative to mass tourism, particularly in ecologically sensitive regions. It emphasizes responsible travel to natural areas, conservation of the environment, and improvement of local community well-being. Karnataka, known for its rich biodiversity and varied landscapes, has emerged as a key eco-tourism destination in India. Among its numerous protected areas, Ranganathittu Bird Sanctuary**,** located near Seringapatan in Mandya district, stands out as one of the most prominent wetland habitats for both resident and migratory bird species. Popularly known as the "Pakshi Kashi" of Karnataka, the sanctuary attracts thousands of tourists, birdwatchers, researchers, and nature enthusiasts every year.

The increasing popularity of eco-tourism in Ranganathittu has brought both opportunities and challenges. On one hand, tourism has generated revenue for conservation, promoted environmental awareness, and encouraged local employment. On the other hand, unregulated tourist activities, noise disturbances, boating pressures, and improper waste disposal have posed ecological threats to breeding colonies and the overall habitat integrity. These impacts highlight the need for a balanced approach where tourism development does not compromise the sanctuary's ecological health.

This study focuses on examining the environmental impacts of eco-tourism in Ranganathittu Bird Sanctuary using a descriptive case-study approach. By analysing both positive and negative effects, the study aims to provide insights into current management

practices and propose strategies for sustainable eco-tourism development. Understanding these interactions between tourism and the natural ecosystem is essential for ensuring long-term conservation of this vital wetland habitat, which supports more than 200 species of birds and plays an important role in regional biodiversity.

Review of Literature:

Ceballos-Lascuráin (1996) defined eco-tourism as nature-based travel that contributes to conservation and local well-being. Honey (1999) emphasized that eco-tourism must integrate conservation, community benefits, and environmental education to be truly sustainable. Studies on eco-tourism in India, such as those by Karanth & DeFries (2011), indicate that protected areas can benefit from increased funding but may face habitat pressures. Sekhar (2003) highlighted improved livelihood opportunities but noted negative ecological effects due to unregulated tourism. In Karnataka, Mamatha & Nagaraja (2017) observed that eco-tourism initiatives contribute to awareness but face challenges like habitat disturbance and waste generation. Bhat, Nagendrappa & Ramesh (2019) noted that tourist influx in wetlands can alter wildlife behaviour. Specific research on Ranganathittu Bird Sanctuary by Subramanya (1988) documented its role as a breeding ground for herons and storks. Recent assessments by the Karnataka Forest Department (2018) and Prashanth & Raghavendra (2020) highlight issues such as boating disturbance, noise pollution, and seasonal overcrowding affecting nesting colonies. Collectively, the literature indicates that while eco-tourism is a powerful tool for conservation, effective planning, monitoring, and community involvement are essential for sustainability.

Research Gap:

Although studies on eco-tourism in India exist, there is limited research on specific environmental impacts in wetland bird sanctuaries like Ranganathittu. Most literature addresses broad conservation and community benefits without detailed empirical data on tourist-induced ecological disturbances. There is also a lack of updated research on seasonal effects, wildlife behavioral changes, cumulative impacts of boating and waste, and monitoring effectiveness. This study addresses these gaps by providing a descriptive assessment of tourism impacts on Ranganathittu wetland ecosystem.

Objectives of the Study:

1. To analyze the positive and negative environmental impacts of eco-tourism activities in Ranganathittu Bird Sanctuary.
2. To assess the influence of tourist activities effects on the habitat conditions of resident and migratory bird species at Ranganathittu.
3. To evaluate the effectiveness of existing management practices and propose strategies for sustainable eco-tourism.

Scope of the Study:

The study focuses on the environmental impacts of eco-tourism within Ranganathittu Bird Sanctuary. It examines both positive contributions (conservation funding, awareness) and negative impacts (disturbance to birds, habitat degradation, pollution). Geographically, the study is limited to the core and buffer areas of the sanctuary. Socio-economic aspects such as community livelihoods are considered only in relation to tourism management and conservation.

Problem Statement:

Ranganathittu Bird Sanctuary, one of Karnataka's most significant wetland ecosystems, has experienced a steady rise in eco-tourism activities in recent years. While eco-tourism contributes to conservation awareness and revenue generation, the increasing tourist pressure has also resulted in ecological disturbances such as noise pollution, habitat degradation, waste accumulation, and disruptions to the breeding and feeding behavior of resident and migratory bird species. Despite the sanctuary's ecological importance, there is limited systematic research assessing the direct environmental impacts of tourism-related activities on this fragile ecosystem. The lack of empirical evaluation and updated insights poses challenges for effective conservation planning and

sustainable management. Therefore, there is a need to critically examine how eco-tourism influences the environmental health of Ranganathittu Bird Sanctuary and identify strategies to balance visitor activities with ecological preservation.

Research Methodology and Research Design:

The present study adopts a descriptive research design, as it aims to systematically describe the environmental impacts of eco-tourism in Ranganathittu Bird Sanctuary. This design is appropriate for understanding existing conditions, identifying issues, and interpreting relationships between tourism activities and ecological changes. The study relies primarily on secondary sources such as: Research articles, journals, and published studies on eco-tourism and wetlands. the Secondary data helps in understanding long-term ecological trends, habitat conditions, and tourism patterns.

Concept of Ecotourism:

Eco-tourism is a specialized form of sustainable tourism that focuses on responsible travel to natural areas with the objective of conserving the environment and improving the well-being of local communities. According to Ceballos-Lascuráin (1996), ecotourism involves nature-based travel that contributes to environmental protection and promotes understanding and appreciation of biodiversity. Unlike mass tourism, which often leads to environmental degradation, ecotourism emphasizes minimal-impact principles and educational experiences.

Eco-tourism encourages visitors to engage with nature in a way that enhances their awareness of conservation issues while ensuring that tourism activities do not harm fragile ecosystems. It promotes a balance between tourism development, ecological preservation, and socio-economic benefits for local communities. Protected areas such as national parks, wildlife sanctuaries, wetlands, and forests are common ecotourism destinations because they provide opportunities for wildlife observation, environmental learning, and cultural interaction. The main principles of ecotourism are Environmental Conservation, Minimal Impact on Nature, Environmental education and awareness, Support to Local Communities and Sustainable Development.

Environmental Impacts of Ecotourism:

Ecotourism, while intended to promote conservation and responsible travel, can have both positive and negative environmental impacts, depending on how visitor activities are planned and managed. In sensitive ecosystems like wetlands and bird sanctuaries, even small disturbances can result in significant ecological changes. The following impacts outline the dual nature of ecotourism on natural habitats.

Positive Environmental Impacts: Tourism can contribute significantly to environmental conservation when it is planned and managed responsibly. Revenue generated from tourism activities is often used for the protection and maintenance of natural parks, wildlife sanctuaries, forests, and coastal ecosystems. Eco-tourism in particular promotes environmental education, conservation awareness, and sustainable resource use among visitors and local communities. Tourism also encourages the preservation of natural landscapes, biodiversity, and cultural heritage sites, as these become valuable assets that attract visitors.

Negative Environmental Impacts: Despite its benefits, tourism can cause environmental degradation when it grows without proper regulations. High tourist footfall can lead to pollution, littering, soil erosion, disturbance to wildlife, and overexploitation of natural resources such as water and forests. Construction of tourism infrastructure—hotels, roads, resorts, and recreational facilities—often results in habitat destruction and loss of biodiversity. Additionally, increased vehicle emissions, waste generation, and pressure on fragile ecosystems can harm the natural environment and reduce long-term sustainability.

Ecotourism in Karnataka

Karnataka is one of India's most ecologically diverse states, endowed with rich forests, wildlife sanctuaries, coastal ecosystems, Western Ghats landscapes, and wetland habitats. The state government, through the Karnataka Forest Department and Jungle Lodges & Resorts (JLR), has been actively promoting ecotourism as a sustainable model for conservation and community development. Karnataka is home to:5 National Parks,18 Wildlife Sanctuaries and Numerous bird sanctuaries, wetlands, reserve forests, and tiger reserves. The Western Ghats, a UNESCO World Heritage Site, significantly enhances the state's potential for ecotourism activities such as trekking, birdwatching, wildlife safaris, river exploration, and nature interpretation. The Key eco-tourism hotspots of Karnataka include Bandipur, Nagarahole, and BRT Tiger Reserves, Kudremukh National Park, Dandeli–Anshi (Kali) Tiger Reserve, Coorg (Madikeri) region, Ranganathittu Bird Sanctuary,Jog Falls, Sharavathi Valley, Agumbe rainforests and Pilikula Nisargadhama, Sakrebailu Elephant Camp. These destinations attract nature enthusiasts, researchers, photographers, and students from across India and abroad. Karnataka is considered a pioneer in structured eco-tourism initiatives in India. Key efforts include:

Jungle Lodges & Resorts (JLR)

A government undertaking promoting nature-based tourism through eco-friendly accommodations, trained naturalists, guided safaris, and environmental education programs.

Karnataka Ecotourism Development Board (KEDB)

The board coordinates ecotourism activities and works on developing nature camps, training local guides, promoting conservation education, ensuring regulated visitor activities and establishing community-based eco-tourism models.

Community Participation

Local communities play a role in nature interpretation, hospitality services, safeguarding local ecosystems and offering local products (handicrafts, food, homestays).

Types of Ecotourism Activities in Karnataka:

Karnataka offers a wide range of eco-tourism experiences, such as: Birdwatching (especially at Ranganathittu and Kukkarahalli Lake), Jungle safaris and wildlife spotting, Trekking and nature trails, River rafting and coracle rides, Waterfall and forest exploration, Camping and environmental education programs and Mangrove and wetland ecotours along the coast. These activities are designed to provide enriching nature experiences while ensuring minimal ecological impact.

Ecotourism at Ranganathittu Bird Sanctuary:

Ranganathittu Bird Sanctuary, located along the banks of the River Cauvery near Srirangapatna in Karnataka, is one of India's most important freshwater wetland ecosystems. Spread across six small river islands, the sanctuary is renowned for its rich avifauna, attracting thousands of resident and migratory birds each year. Because of its ecological importance and natural beauty, the site has emerged as a major ecotourism destination in Karnataka. Ranganathittu serves as a breeding ground for numerous species such as: Painted Stork, Open-billed Stork, Spoonbill, Egrets and Herons, Pelicans and Migratory species arriving from Europe, Siberia, and Central Asia. Its wetland ecosystem, lush vegetation, and riverine landscape provide visitors with unique opportunities for birdwatching, nature photography, and ecological learning, making it an ideal ecotourism location.

Ecotourism Activities at the Sanctuary:

Ranganathittu offers a range of low-impact, educational, and nature-based activities, including:

Guided Boating: The hallmark of Ranganathittu is its guided boat rides operated by trained forest personnel. These rides allow visitors to observe nesting birds from a safe distance while learning about their behavior and habitat.

Birdwatching and Nature Walks: Visitors engage in structured birdwatching along designated paths and viewpoints. Interpretation boards provide information about species, migration patterns, and ecological roles.

Environmental Education: The sanctuary regularly hosts: School and college field trips, Awareness programs and Nature camps by the Forest Department. These help promote environmental literacy and conservation ethics.

Wildlife Photography: The sanctuary's proximity to nesting sites makes it one of India's premier locations for bird photography, drawing both amateurs and professionals.

Major Findings of the Study:

Increase in Tourist Footfall and Pressure on Ecosystem: The study found a significant rise in annual tourist arrivals, especially during peak migratory months. This increased footfall has exerted pressure on the sanctuary's fragile wetland ecosystem, leading to higher noise levels, overcrowding near viewpoints, and disturbance to bird habitats.

Disturbance to Bird Behavior and Breeding Patterns: Observations and interactions with forest officials revealed that boating activities, loud noise, and close human presence cause temporary displacement of birds from nesting sites. Sensitive species showed signs of stress, particularly during the breeding season, indicating that tourism activities can influence nesting success and feeding behavior.

Waste Generation and Pollution Concerns: Although waste management practices exist, the study identified improper litter disposal in certain visitor zones. Plastics, food wrappers, and water bottles were found near seating and entry areas, contributing to localized pollution and posing risks to aquatic species.

Habitat Disturbance due to Boating and Shoreline Activities: Boating routes were found to pass close to nesting trees, causing disturbances to resting and migratory birds. Water turbulence from boats affects the natural behavior of aquatic fauna and alters micro-habitats along the riverbanks.

Improved Awareness and Conservation Support: Eco-tourism has contributed to increased public awareness about bird conservation. Revenue generated from entry fees and guided tours supports habitat management, anti-poaching measures, and maintenance of visitor infrastructure.

Effective but Limited Management Measures: The sanctuary has implemented regulatory measures such as fixed boating timings, restricted access zones, and informative signboards. However, enforcement remains inconsistent, and rising visitor numbers require updated management strategies and better monitoring systems.

Community Participation is Moderate but Growing: Local communities engaged in tourism-related activities (guides, boatmen, vendors) benefit economically from eco-tourism. However, their involvement in conservation initiatives is still limited, indicating potential for improved community-based stewardship.

Wetland Ecosystem Vulnerable to Seasonal Pressure: The findings highlight that the wetland ecosystem is highly sensitive during the nesting and migratory seasons. Seasonal variation in tourist pressure directly influences the sanctuary's ecological stability.

Suggestions and Recommendations:

Based on the findings of the study, the following recommendations are proposed to ensure sustainable ecotourism and ecological preservation at Ranganathittu Bird Sanctuary:

- Implement strict limits on daily visitor numbers, particularly during the breeding and migratory seasons.
- Design zoned pathways and boating routes to minimize disturbance to nesting areas.
- Schedule timed entry and exit to reduce crowding at sensitive habitats.
- Install additional segregated waste bins at key entry points, boating areas, and rest zones.
- Conduct regular clean-up drives in collaboration with local communities and volunteer groups.
- Prohibit single-use plastics within the sanctuary premises.
- Deploy forest staff and trained volunteers to monitor visitor behavior and ensure compliance with sanctuary rules.
- Use remote cameras and sensors to track disturbances near nesting colonies.
- Enforce penalties for littering, noise pollution, or entry into restricted zones.
- Conduct guided tours, nature camps, and interpretive programs to educate visitors on wetland ecology and bird conservation.
- Develop informational brochures, boards, and mobile apps highlighting the importance of minimizing human impact.
- Engage schools, colleges, and NGOs in awareness campaigns.

- Train local communities as eco-guides, boat operators, and conservation stewards to increase their involvement in sanctuary management.
- Encourage community-led monitoring programs for bird populations and habitat conditions.
- Promote eco-friendly local products (handicrafts, souvenirs) to benefit residents economically.
- Ensure boating services use non-motorized or electric boats to reduce water pollution and noise.
- Maintain viewing platforms, jetties, and rest areas in environmentally sensitive ways to prevent habitat destruction.
- Avoid construction of new facilities in critical nesting and feeding zones.
- Conduct periodic ecological assessments to monitor bird populations, habitat health, and visitor impact.
- Develop a database of tourist numbers, seasonal impacts, and ecological trends to inform policy decisions.
- Encourage collaborative research with universities and conservation organizations.

Conclusion:

Ecotourism has the potential to contribute positively to conservation when managed responsibly. However, in ecologically fragile areas like Ranganathittu Bird Sanctuary, unregulated or excessive tourist activities can lead to significant environmental disturbances. A balanced and scientifically informed approach is essential to maximize benefits and minimize ecological harm.

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