

Ecotourism integrated Conservation planning for Goshree Islands

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Abstract - Ecotourism has been a sustainable tourism method that supports environmental protection while ensuring socio-economic gains for local communities. This research paper discusses how ecotourism is related to conservation, specifically the contribution of sustainable tourism towards the preservation of such vulnerable ecosystems. The study reviews existing literature on ecotourism, the conservation of mangroves, and India's prevailing conservation policies and programs. To create a viable ecotourism model, best practices of successful ecotourism operations globally are analyzed, and essential planning and conservation strategies that can be applied to the study area are identified. Site-specific analysis is carried out to evaluate mangrove conditions, tourism facilities, and conservation efforts through surveys and interviews with stakeholders.

The research emphasizes that though ecotourism can promote conservation, poor infrastructure, absence of regulation, and limited community involvement constrain its effectiveness. The research concludes with strategic proposals for ecotourism development such as environmentally friendly tourism infrastructure, sustainable visitor management, and community-led conservation activities.

Key Words: Ecotourism, Mangroves, conservation,

1. INTRODUCTION

Ecotourism is a sustainable type of travel that offers tourists worthwhile experiences in natural environments, emphasizing environmental preservation, community service, and education. It is an essential tactic for protecting biodiversity, advancing cultural heritage, and creating favorable economic conditions for nearby communities. By combining ecotourism with conservation initiatives, it is made sure that travel-related activities enhance environmental preservation rather than worsen it. Ecotourism promotes the conservation of natural ecosystems such as coral reefs, mangroves, forests, grasslands, etc.

Mangroves are salt-tolerant plants found in tropical and subtropical intertidal regions worldwide. These regions are called mangrove ecosystems. Mangroves are breeding, feeding, and nursery grounds for many estuarine and marine organisms, including finfish and shellfish. Although mangrove forests cover less than 0.5 % of the oceans, they store more than 14 % of their carbon [3].

India has a mangrove forest cover of 4991 sq. Km, occupying only 3.2% of global mangrove forests. Sundarbans have the largest mangrove cover, occupying 43% and Gujarat has the second largest cover with 23% of the total cover in India. The two areas alone occupy 66% of the mangrove cover, surprisingly in adverse conditions of high energy tidal coast, experiencing two extreme situations [7]. The Goshree Islands in Kochi, Kerala, are known for their ecological significance and the presence of mangrove ecosystems. However, the increasing pressure from urbanization and fishing activities has led to environmental degradation in the region. Recognizing the importance of mangroves in ensuring ecological balance and supporting livelihoods, it becomes essential to study the status of mangroves on the Goshree Islands and explore sustainable conservation practices.

Ecotourism-integrated conservation will help mitigate the challenges and improve people's awareness through proper ecotourism development. This study explores integrated ecotourism planning as a tool for conservation while ensuring community participation and sustainable economic opportunities. Implementing low-impact tourism infrastructure, mangrove restoration, sustainable transport, and eco-friendly policies can create Goshree Islands

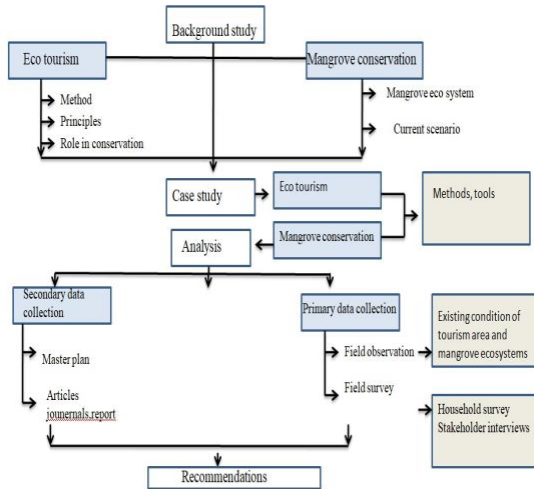
1.1 Aim

To develop an ecotourism-integrated conservation planning for Goshree Islands

1.2 Objective

- To study the concept of ecotourism, methods, principles, and role of ecotourism in conservation
- To study the environmental importance of Mangrove and the current scenario of mangrove conservation in India
- To identify methods and tools from best practices of ecotourism planning and conservation
- Assess existing study area conditions and analyze ecotourism planning through surveys and interviews.
- To provide strategic recommendations for the ecotourism-integrated conservation planning for Goshree Island.

1.3 Methodology



2. LITERATURE REVIEW

2.1 Ecotourism

Eco-tourism is defined in different ways “traveling to relatively undisturbed or uncontaminated natural areas with the specific objective of studying, admiring, and enjoying the scenery and its wild plants and animals, as well as any existing cultural manifestations (both past and present) found in these areas” (Boo 1990: xiv).

“Ecotourism is low-impact nature tourism that contributes to the maintenance of species and habitats either directly through a contribution to conservation and/or indirectly by providing revenue to the local community sufficient for local people to value and therefore protect, their wildlife heritage area as a source of income “(Goodwin 1996: 288) and “responsible travel to natural areas which conserves the environment and improves the welfare of local people”(Western 1993: 8). The ecotourism development is mainly concentrated on the for fundamental pilers which include [1]:

1. Minimum environmental impact;
2. Minimum impact on – and maximum respect for – host cultures;
3. Maximum economic benefits to the host country’s grassroots; and
4. Maximum ‘recreational’ satisfaction to participating tourists

Eco-tourism exists in various types based on the activity involved. It is mainly classified into Nature-based tourism, adventure tourism, culture, and voluntourism. It mainly focuses on the visitor experience and their involvement in the activity.

Ecotourism is a low-impact, non-consumptive, and locally controlled form of nature-based tourism that is primarily centered on learning about nature firsthand and is ethically operated to be of low impact, non-consumptive, and controlled (control, benefits, and scale). It is normally found in natural places, and ought to contribute to the protection of such places.

It also assists in

Habitat Conservation – Ecotourism produces income that may be directed toward habitat preservation, conservation of threatened species, and ecologically sustainable land use.

- Local Community Participation – Involving local communities in ecotourism makes them economically benefit, relieving reliance on environmentally destructive practices such as deforestation or hunting.

- Education & Consciousness – Tourists learn about conservation problems, generating a feeling of obligation to preserve nature.

- Sustainable Infrastructure – Low-impact tourism facilities, nature trails, and eco-lodges support the conservation of the natural surroundings while providing accommodation to tourists.

- Policy & Governance – Conservation policies like carrying capacity restrictions and eco-certifications help prevent degradation of the environment through tourism.

2.2 Mangrove ecosystem

Mangroves are woody vegetation that occurs on tropical and mild temperate coasts, where they form the world’s sole tall tree forests. Mangroves have developed specifically to grow in hostile environments where other plant species are unable to. This is a structurally simple forest system that yields more biomass in estuary and intertidal areas than any other marine system on the Earth. Its standing crop is also the highest. With viviparous germination, highly developed aerial roots, salt control, and nutrient conservation, it is physically as well as functionally distinct. Referred to by many names, such as "Coastal woodland," "Oceanic rainforest "and" Tidal Forest, "mangroves are the only “blue carbon” forests that occur in the sea.

It is a limited kind of forest in the globe that has just 73 species of trees, covering 15.2 million hectares in 123 nations³. Mangroves are special coastal biomes that are made up of small shrubs or trees that line shorelines, growing well in salty sediments that may be permanently submerged in water. They occur in tropical and subtropical areas only and mostly along protected coastlines, where conditions in the environment support their survival and growth

In FAO's Global Forest Resources Assessment (FRA 2020), the FAO analyzed global mangrove cover and concluded that mangrove forests cover 14.72 Mha in 113 countries. The distribution here is highly uneven. South and Southeast Asia account for 36.2% (5.33 Mha) of global mangrove cover, followed by South America with 2.12 Mha, Western and Central Africa with 2.30 Mha, North and Central America with 2.55 Mha, and Oceania with 1.26 Mha.[14]

In India, the whole mangrove ecosystem is generally classified into three regions: (i) the East Coast, (ii) the West Coast, and (iii) Andaman & Nicobar Islands, together with the Lakshadweep atoll (Dagar et al., 1991)[4]. The East Coast boasts no less than 40 species of mangroves spread across 14 families and 22 genera. On the West Coast, there are 27 species distributed over 11 families and 16 genera. Andaman & Nicobar Islands have 38 species from 13 families and 19 genera. There is limited coverage of Mangroves in Lakshadweep by 3 species. Among the 13 States/Union Territories, there is the highest mangrove diversity in Andaman & Nicobar Islands where exceptional species such as *Rhizophora lamarckii*, *Lumnitzera littorea*, *Sonneratia ovata*, *S. lanceolata*, *S. urama*, and *S. gulngai* exclusively exist[14]

Importance of mangrove ecosystem:

Mangroves are key ecosystems that ensure biodiversity by being nurseries to juvenile fish, prawns, and crabs. Supporting a record 1,533 species (UNEP 2023), they harbor protected environments which safeguard marine species from predators as well as harsh environmental conditions. Mangrove ecosystems ensure ecological equilibrium by providing feeding grounds, habitats, and breeding grounds for the different species.

Mangroves support coastal economies by providing food items like fish, molluscs, and crustaceans to local diets and livelihoods. Their economic value is between USD 33,000 and USD 57,000 per hectare per year. They also offer timber, firewood, charcoal, and roofing materials to both small- and large-scale fisheries, contributing to food security and job creation.

In addition to economic value, mangroves are of cultural and historical importance, associated with local heritage and traditions. Mangroves facilitate research and education, providing knowledge of biodiversity and environmental processes. As natural buffers, mangroves reduce flood hazards, stabilize shorelines, and defend coastal infrastructure against erosion and storms, providing long-term resilience for coastal communities.

Mangroves provide various benefits to the people as well as the environment. They act as a carbon sink to store carbon and it is also known as the blue carbon Mangroves for sustainable development goals. It acts like a biodiversity

hotspot, protects the soil from coastal erosion, improves the water quality, and provides natural resources for the people.

The role of mangroves is closely aligned with several of the United Nations' Sustainable Development Goals (SDGs):

- SDG 1: No Poverty, and SDG 2: Zero hunger
- SDG 6: Clean Water and Sanitation
- SDG 8: Decent work and Economic growth
- SDG13: Climate Action

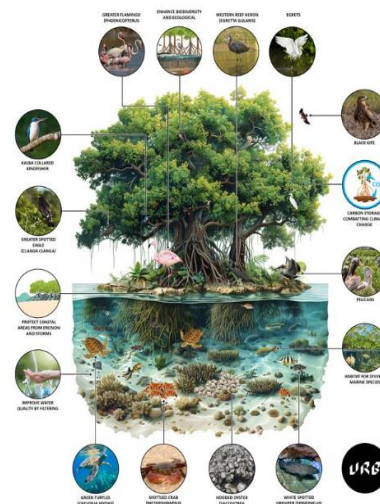


Fig -1: Ecosystem services of mangrove

Source: <https://urb.ae/projects/dubaimangroves/>

- SDG 14: Life below water
- SDG 15: Life on Land

2.3 Mangrove Conservation in India

India's mangrove ecosystems are protected via various initiatives. For promoting the utilization of wetlands and indigenous livelihoods, India has adopted the nature-based solution (NbS) strategy in Union Budget 2023. It initiated the "Mangrove Initiative for Shoreline Habitats and Tangible Income (MISHTI)" and "Amrit Darohar."

In India, it is implemented under various plans and programs, including the National Action Plan on Climate Change (NAPCC) missions and the Mahatma Gandhi National Rural Employment Scheme (MGNREGA) [17]. "Actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, while simultaneously providing benefits to biodiversity and human well-being," is the way the IUCN defines NbS. By harnessing the nature-tourism opportunities of Ramsar Sites across the nation, the program intends to

enhance the quality of life of residents in those communities [4].

It is also protected under the:

- Coastal Regulation Zone (CRZ) Notification (2019) under the Environment (Protection) Act, 1986
- The Wild Life (Protection) Act, 1972
- The Indian Forest Act, 1927
- The Biological Diversity Act, 2002
- National mangrove mission
- Mangroves for the Future (MFF) Program
- Conservation and Management of Mangroves and Coral Reefs 'under the National Coastal Mission Programme.
- The Paris Agreement
- The Mangrove Breakthrough.

3.CASE STUDIES

Ecotourism is used as a tool for conservation planning in different cities here consider the best practices of Mangrove conservation which include the case of Karnataka and Andaman and Nicobar Islands. Ecotourism case studies of Wonorejo and Kadalundi-Vallikkunnu Community Reserve.

The mangrove conservation in Karnataka aims at the restoration of more than 300 hectares of land in Karwar and Honnavar. The project supports the biodiversity and livelihoods of locals through the inclusion of Indigenous groups and local government. Conservation methods involve protected areas, regulated fishing quotas, and limited tourism. Affected sites are kept closed for natural regrowth, and mature areas are checked for the least environmental effect. This process guarantees ecological balance and economic prosperity.[16]

With about 615 sq. km of mangroves, the Andaman and Nicobar Islands focus on environmental stability, economic dividends, and mitigation of disaster risk. Conservation involves buffer zones (20m along major creeks, 10m along minor creeks), and brushwood barriers to avoid seed washout and afforestation drives. Development is prohibited in sensitive areas, and visitor education such as mangrove interpretation centers and watchtowers encourage responsible eco-tourism. This ensures long-term sustainability.[2]

Wonorejo Mangrove Ecotourism, Surabaya spans 700 hectares, Wonorejo Mangrove Ecotourism strikes a balance between conservation, tourism, research, and education.

Zoning measures to avoid interfering with protected areas consist of limited conservation zones, eco-trails, and buffer zones from urbanization. Developments within the vicinity of the ecotourism area require Environmental Impact Assessments (EIA). Regulated by Regional Regulation Number 3 of 2007, the program supports sustainable tourism while maintaining ecological integrity.[9]

Kadalundi-Vallikkunnu Community Reserve (KVCR), Kerala Situated on the other side of the Kadalundi estuary in Kerala, KVCR is a prototype of sustainable eco-tourism. The area boasts a picturesque river, mangrove islands, and a variety of bird species such as Gulls, Terns, and Plovers. Eco-tourism offers guided country boat trips for bird watching and wildlife spotting, in addition to fishing tours. Handled by the Community Resource Management Committee (CRMC), the project provides for local involvement with licensed boatmen adhering to eco-friendly guidelines. This model effectively combines conservation, tourism, and community development.[15]

4 STUDY AREA

The study area chosen for the current study is Vypin Kuzhuppilly, Edavanakad, Pallipuram, Nayarambalam, Njarakkal, Elamkunnappuzha, Mulavukadand, Kadamakkudy. They are one of the groups of islands that belong to the Cochin estuary in the South Indian state of Kerala (Figure- 2). Puthuvype Island, Bolgatty Island, and Vallar Padam Islands are prominent landforms within the Cochin estuary, grappling with dense populations and a host of environmental issues such as coastal erosion and increasing sea levels caused by both human activities and natural phenomena.

The study area lies between 10° 12' and 9° 55" latitude and 76° 10' and 76° 18' longitude along the Arabian Sea on the west coast of Kochi. It consists of the narrow strip of coastal sandbar lying between the Azhikode Bar mouth on the north and the Kochi Bar mouth on the south and several islands lying in the backwaters east of it. The total area is 106.84 Km². These islands lie close to Kochi, the fastest-growing city in Kerala.

The occupation of majority of the people are fishing the presence of water bodies like Vemband kayal, Periyar and other canals which create the fisheries wealth and they mainly depend on them for their livelihood.

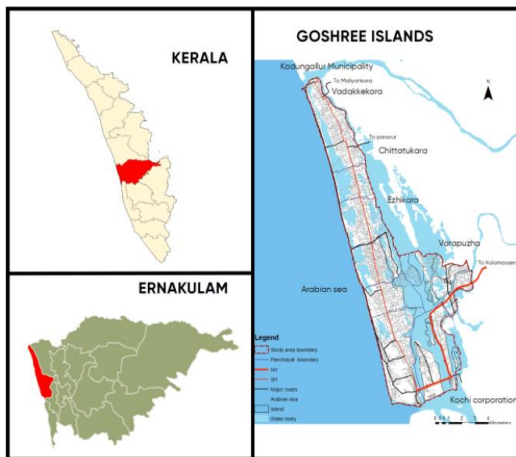


Fig -2: Location of study area

3.1 Status of Mangrove in the Study Area

The study region comprises an area of mangrove of 2.93 km square. It provides a significant share of the mangrove cover in the Ernakulam district. They experience a loss of mangrove cover throughout the year due to infrastructure development and an increase in Aquaculture. These areas can be seen from the several studies carried out in the study region. Approximately 40% of mangrove area has been lost in recent years. There is an urgent conservation need for the existing mangrove cover. Mangrove islands in Kochi are being threatened more and more by population pressure, aquaculture activities, and mangrove environment conversion into new shrimp ponds. Industrial effluent discharge, oil spillage, tidal storms, dredging for landfill and port construction, industrial estate, and housing estate construction for man have caused mangrove destruction in Kochi [9].

In Kerala, there are 18 true mangrove species and 49 associates among them Mangrove species present in the study area are *Acanthus ilicifolius*, *Bruguiera gymnorrhiza*, *Rhizophora mucronate*, *Bruguiera cylindrica*, *Kandelia candel*, *Sonneratia caseolaris*, *Rhizophora apiculate*, *Bruguiera sexangular*, *Acrostichum aureum*, *Excoecaria agalloch*[8]

A higher area of mangrove can be seen in Elamkunnappuzha panchayat. The coastal region extending from Elamkunnappuzha and Nayarambalam shows the mangrove patches in higher concentration. The Puthuvype area in Elamkunnappuzha has 200ha of mangrove forest. The Mulavukadu panchayat is also the major location of mangrove patches due to the coastal ecosystem. However, this area is facing a threat due to the infrastructure development and conversion of land to shrimp farming.

3.2 Tourism in Goshree Islands

Study location in Kochi has picturesque beaches such as Cherai, Kuzhuppilly, Puthuvype, and Munambam, which

provide scenic beauty and a peaceful environment, and Munambam Fishing

Harbor for local fishing practices. Some ayurvedic retreat centers also operate primarily in Cherai Beach which welcomes the international visitor as well. The study area has several natural features which invite tourism to the region. Some historically important places are also available over the region which were constructed during the time of the Portuguese. Kadamakkudy island is filled with backwater, paddy fields, and green areas the region facilitates village tourism and draws international and domestic travelers too. The primary activity of the region is fishing it is also being turned into tourism in certain parts of the region and it facilitates aqua tourism and offers fishing and boating services to the visitors they also serve traditional food to the visitors for promoting the culture of the region. This region has high potential with a spreading beach of 24 km and nature-based tourism destinations.

Aqua farms are the prime eco-tourism attraction in the locality. Which provides the tourists with an opportunity to experience the fishing and boat services offered in the locality. It also enables them to provide more information on the traditional fish-catching method and the various varieties of fish there. Vypin Island boasts a natural locale by the name of poyil which encourages aqua farm and paddy field

This region attracted a large number of migratory birds as well as the local birds. Valiya Kadamakkudy, the Puthuvypee LNG site, and the CMFRI site are the principal bird-watching sites. The migratory birds can be best seen during the months of November to February. There are approximately 500 species of birds-resident and migratory-which inhabit the green tropical forests, many freshwater and brackish lakes, and waterlogged paddy fields of the region. Mangrove zones available in Puthuvypeen and Cherai are the primary bird hotspots because of their natural habitat. It also invites tourists and bird enthusiasts to this area.

3. Analysis and findings

The Ghosree Islands are an ecologically sensitive area with diverse natural characteristics. Its major concern was the presence of thick mangrove forests and the diversity that accompanies them. Migratory and native birds are present in the hot spots of the study area because of the high density of mangroves and wetland habitats. The islands support a diverse range of mangrove species, fish, bird, and other organisms. Due to the richness in water bodies and diversity in ecosystems, this coast region has a high potential to develop ecotourism.

However, pollution, land reclamation, development of infrastructure, and shrimp aquaculture are the primary reasons for the degradation of mangrove status. So, there is a need for strict rules and regulations

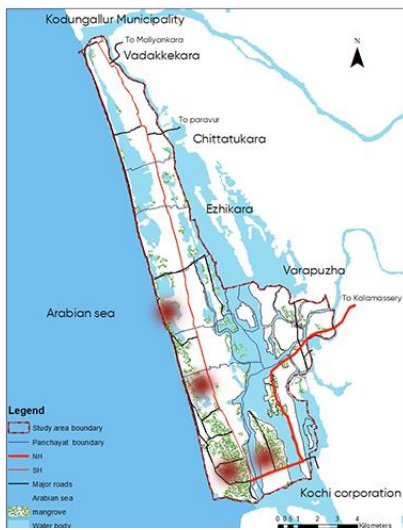


Fig -3: identified area of mangrove loss

Regions of mangrove decline determined by primary survey and stakeholder interviews is highlighted in fig- 3. Land conversion and trash disposal are the two biggest issues facing mangroves.

mainly on private vehicles. It also considered the future expanded root of water metro roots which will start in a few months. From that, it is analyzed that areas are well connected. But there is a lack of public transport facilities to reach the town areas. So, the tourist destination currently facing parking issues and congestion.

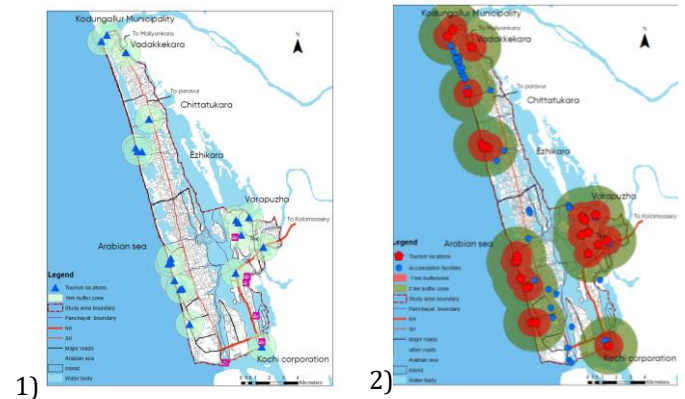


Fig -4: 1) Accessibility within 1 km buffer 2) Accommodation facilities within 1 and 2 km

Accommodation facilities are also available within 1km and 2 km from the tourist destinations. So, Tourists can easily assemble to accommodation facilities but there is a lack of medical facilities near the destinations.

3. CONCLUSIONS AND RECOMMENDATIONS

Mangrove ecosystems play a crucial role in coastal protection, biodiversity conservation, and sustainable livelihoods. However, rapid urbanization, climate change, and unregulated tourism pose significant threats to their survival. This study examined the intersection of ecotourism and mangrove conservation, analyzing existing literature, government schemes in India, and the status of mangroves and tourism infrastructure at the chosen site. The findings highlight both the potential and challenges of ecotourism as a conservation tool. While various policies and initiatives aim to protect mangroves, gaps in enforcement, inadequate infrastructure, and lack of community engagement hinder effective implementation. Through this research, it is examined that Goshree Island comprises various types of coastal ecosystems that should be preserved and recovered. The native people of this region are totally reliant on the surrounding environment for their livelihood most of them are fishermen. The crisscrossed water bodies of this region are utilized by the people for transportation purposes as well as fishing. At the time of the field survey, it is observed that most of the population in the area is aware of the significance of the ecosystem and biodiversity. There exists a variety of flora and fauna here it will assist in enhancing the ecotourism development in this region.



Fig -4: Identified issues faced in the study area

3.1 Proximity analysis of tourism infrastructure

Goshree Island consists of numerous tourist destinations which attract domestic and international tourists as well. Through the field survey it is identified that most of the tourist destination in the study area is mainly attracted by the domestic tourist. The main challenge faced by the current tourist destination is the lack of infrastructure. Considering the proximity analysis of the accessibility to tourist destinations most of the area is well connected by road and water transport but there is a lack of public transport facilities in some areas. Which leads to depending

The mangrove ecosystem in the area is under threat from urbanization, land conversion, etc. Thus, ecotourism development assists in raising awareness and protection of present mangrove systems. These wetlands and mangroves are the home for the animals, mollusks, fishes, and birds. Thus, they can generate interest to the environmentalists and ecotourists which also assists in generating the economic value to the areas. Thereby it can assist in enhancing the livelihood and basic infrastructure of the region.

Based on the survey from the field, it is studied that most of the people are ready to be involved in ecotourism activities and support the construction of environment friendly infrastructure. People's participation in decision-making and activities contributes to the development of the people as well as enhances their knowledge to be a part of conservation activities.

Intensifying conservation regulations, encouraging responsible tourism processes, and engaging local communities in ecotourism activities are necessary to ensure a balance between economic growth and the protection of ecological systems. Sustainable tourism investments in infrastructure, more stringent regulation systems, and ongoing monitoring of mangrove health can help improve conservation.

These are some recommendations for ecotourism development in this region.

- Create mangrove conservation areas with nature trails to inform tourists about the environmental significance of mangroves.
- Enforce rigorous environmental laws to restrict human intrusion and avoid habitat loss.
- Encourage community-based conservation initiatives, engaging residents and fishermen in mangrove regeneration activities.
- Construct floating or stilted accommodation from eco-friendly materials to avoid harming the environment.
- Organize eco-tourism boat tours and kayaking in the backwaters, using non-motorized or electric boats to avoid pollution.
- Implement restricted boating zones to protect sensitive mangrove areas and nesting grounds for wildlife.
- Organize guided birdwatching and nature photography tours to attract eco-conscious travelers.

- Set up eco-interpretation centers that give information on mangrove ecosystems, conservation issues, and ecotourism advantages.
- Conduct educational workshops and field trips for students and researchers to raise conservation awareness.
- Implement electric shuttle services or bicycle hire for environmentally friendly local transport.
- Set up nature trails and cycling routes to promote low-impact tourism activities.
- Create buffer zone for tourism activities, conservation etc.

Moving forward, a comprehensive approach integrating policy reforms, scientific research, and community-driven initiatives is necessary to ensure the long-term sustainability of mangrove ecosystems. Future research should focus on assessing ecotourism's long-term ecological and socio-economic impacts on mangroves. By fostering a synergy between conservation and tourism, India can protect its vital mangrove forests while promoting sustainable economic growth.

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