Int J Adv Life Sci Res. Volume 9(4) 107-122
https://doi.org/10.31632/ijalsr.2026.v09i04.007

International Journal of Advancement in Life Sciences Research

Online ISSN: 2581-4877

Journal homepage http://ijalsr.org



Original Article

Assessing the Feasibility of Ecotourism: A Perspective on Doyang Reservoir, Nagaland, India

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Abstract

Background: Ecotourism can contribute to sustainable livelihoods and ecosystem protection, even as environmental degradation and habitat loss persist under population pressure and resource overexploitation. This study aims to assess the ecological, social, and cultural feasibility of river-based ecotourism as a development strategy at the Doyang Reservoir site in the Wokha district, Nagaland. **Methods:** Using snowball sampling techniques, interviews, questionnaires, and field visits, the research estimates the ecotourism potential of activities such as bird watching, trekking, fishing, and cultural exchanges. **Results:** These activities have the potential to provide alternative livelihood options, especially for marginalized groups, reduce pressure on fish stocks, and promote conservation. However, there are still hurdles: environmental risks, lack of infrastructure, lack of awareness, and social conflicts. **Conclusion:** It highlights the need for local capacity building and the establishment of responsible tourism rules to enable communities to manage conservation and ensure fair administration. The results are designed to help policymakers, tourism providers, and local people promote sustainable ecotourism.

Keywords: *Biodiversity Conservation; Community Empowerment; Doyang Reservoir; River-Based Ecotourism; Sustainable Development*

Introduction

In rural areas, the use of natural resources through ecotourism has become a means of improving people's living conditions, reducing poverty, and generating income, while also having positive environmental impacts (World Tourism Organization, 2020; Abdallah & Ninov, 2023). By combining responsible tourism and conservation efforts, ecotourism promotes the sustainable development of rural areas in countries, supporting both their economies and livelihoods (Samal & Dash, 2023). Therefore, we can view tourism in its current form as a stressor to natural resources, potentially leading to their degradation. Traditional tourism differs from ecotourism in that it places less emphasis on low-impact activities and conservation, is not always community-owned or involved, and does not equally share benefits (Xing, 2024).

Nagaland is located in the Indo-Myanmar biodiversity hotspot in northeast India and also has excellent potential for ecotourism (Goswami *et al.,* 2012; Kinny & Lanusosang, 2016; Arijii *et al*., 2025). Its rugged mountains, forests covering over 50% of its landmass, wildlife, and numerous pools,

Received on :6th November 2025; Revised version received on :24th June 2026; Accepted: 3rdAugust 2026

rivers, and lakes make it an ideal destination for ecotourism. It is also a predominantly diverse country, with 17 major tribes and distinct cultures, and many tourists flock there (Rulu & Rahul, 2022). These natural and cultural values provide a robust foundation for the development of river-based ecotourism.

Nagaland is predominantly an agricultural and fishing economy, with its numerous rivers, streams, and lakes contributing to the food security of the rural populace (Alinger, 2024). Fishing is also of cultural and economic importance, and community fishing, angling, bamboo traps, and nets are among the traditional fishing methods practiced (Kechu & Pankaj, 2023). They are also an important part of local festivals and rituals and are a source of food and income (Ovung *et al.,* 2022). However, due to overfishing, industrialization, and climate change, river ecosystems and the livelihoods they support are also facing growing threats. The need for alternative fishing methods that support conservation and income generation has arisen in the wake of the unsustainability of traditional fishing. Ecotourism at the river level is one area where it is possible to shift extraction to more sustainable, environmentally friendly practices that can improve local people's lives. Programs such as catch-and-release fishing, guided tours, cultural exchange, and demonstrations of traditional fishing methods can have both livelihood and conservation objectives (Lalrinawma & Ramasamy, 2025). On the other hand, poor tourist management can lead to the destruction of both the environment and cultural heritage (Buckley, 2011).

Many studies indicate that ecotourism can benefit the environment and society if managed well. It conserves biodiversity and habitats and promotes community involvement in natural resource management through alternative income and conservation incentives (Das & Chatterjee, 2015). Ecotourism prospects can help sustain protected areas and aid conservation. However, not all aspects of ecotourism are positive. If left uncontrolled, it can contribute to overpopulation, habitat destruction, and damage to wildlife and habitats (Pujar & Mishra, 2021; Buckley, 2004). The sustainable development of ecotourism requires robust planning, management of tourists and their activities, community engagement, and conservation while maintaining economic returns.

The Doyang reservoir, situated on the state's longest and largest river, offers many opportunities for ecotourism development. The site has high biodiversity value, harboring a wide variety of ecosystems suitable for Nature-Based Tourism (NBT). Lkr *et al.* (2020) reports that it is known as the ‘Amur Falcon Capital of the World' due to the presence of millions of migratory Amur falcon every year. The area has also been visited by tourists who came to engage in local activities such as angling, boating, trekking, sightseeing, cultural exchanges, and homestays (Kikon, 2021). The reservoir also supports a thriving fishery, both man-made and natural; the former sustains more than 250 fishing households, highlighting its ecological and economic value (Odyuo & Nagesh, 2012). There are significant issues with infrastructure and accessibility; however, many of these sites, such as Doyang, are remote, with limited road access, limited accommodation, and little provision for visitors. In the absence of further investment in infrastructure and management, the development of ecotourism could be restricted. At the same time, the high number of visitors could increase the amount of waste produced, wildlife disturbance, and biodiversity loss.

Residents and tourists need to be educated about sustainable ecotourism. Targeted awareness campaigns, seminars, and workshops (Kulshrestha *et al.,* 2025) can help fulfill this objective. A recent study by Ambusaidi *et al.* (2024) highlights the positive impact of these programs on travellers’ ethical behavior. For the successful implementation of ecotourism, the involvement of local people, stewardship, and equitable distribution of benefits are required.

Studies analyzing the feasibility of river resources for the sustainable development of rural ecotourism in Nagaland remain limited, despite the state's enormous ecotourism potential. Previous studies have mainly focused on biodiversity and cultural richness, while few have examined the contribution of river resources to the rural economy through ecotourism. The migratory bird, the Amur Falcon, is known to visit the Doyang reservoir, and the festivals and rich fishery resources make Doyang a particularly popular recreational site. However, researchers have not thoroughly explored Doyang's potential for

river-based ecotourism, the challenges of developing it, and local stakeholders' perceptions. Therefore, a scientific base is insufficient as a general guide for planning and marketing sustainable river tourism in the zone.

Considering these, this study seeks to investigate the feasibility of river-based ecotourism in the State of Nagaland with Doyang Reservoir in Wokha District as its base area. The study also examines how ecotourism can benefit rural economies and livelihoods, as well as the main constraints to ecotourism development in the riverine region.

Material and Methods

Study Area

Nagaland is one of the eight northeastern states in the country, with a geographical area of 16,579 km². The state has high forest cover, receives heavy rainfall, and features mountainous terrain with many rivers and valleys. Comprising the major rivers of the north (Dikhu and Doyang), the southwest (Barak), and the southeast (tributaries of the Chindwin River in Myanmar), the state has been deeply carved by the rivers (Lkr *et al.*, 2020). Nagaland is one of the most culturally diverse states in India, with 17 tribes, including several sub-tribes, and diverse languages and traditional cultures, providing ample opportunities for ecotourism and the Nagas.

Doyang River and Reservoir

The study was conducted in the Doyang Reservoir (26° 13' 45" N, 94° 17' 45" E) of the Doyang River in the Wokha District of Nagaland. Figure 1 shows the map of the study area, which is divided into different documented ecotourism sites. The Doyang River, about 167 km in length, is the longest and largest river draining the state of Nagaland, with a catchment area of 3,283 km². The river flows from the second-highest peak of Nagaland, called Mount Japfu. It passes through the districts of Kohima, Zunheboto, and Wokha and eventually reaches the Brahmaputra in Assam. (Lkr *et al.,* 2020). Apart from the Doyang Hydroelectric Project, the river is also known for its rich diversity in fish species (Odyuo & Nagesh, 2012). The reservoir (Figure 2: A-D) and its environs also feature numerous ecotourism sites that play a critical role in improving local livelihoods. Table 1 provides some of the notable attributes of the Doyang River.

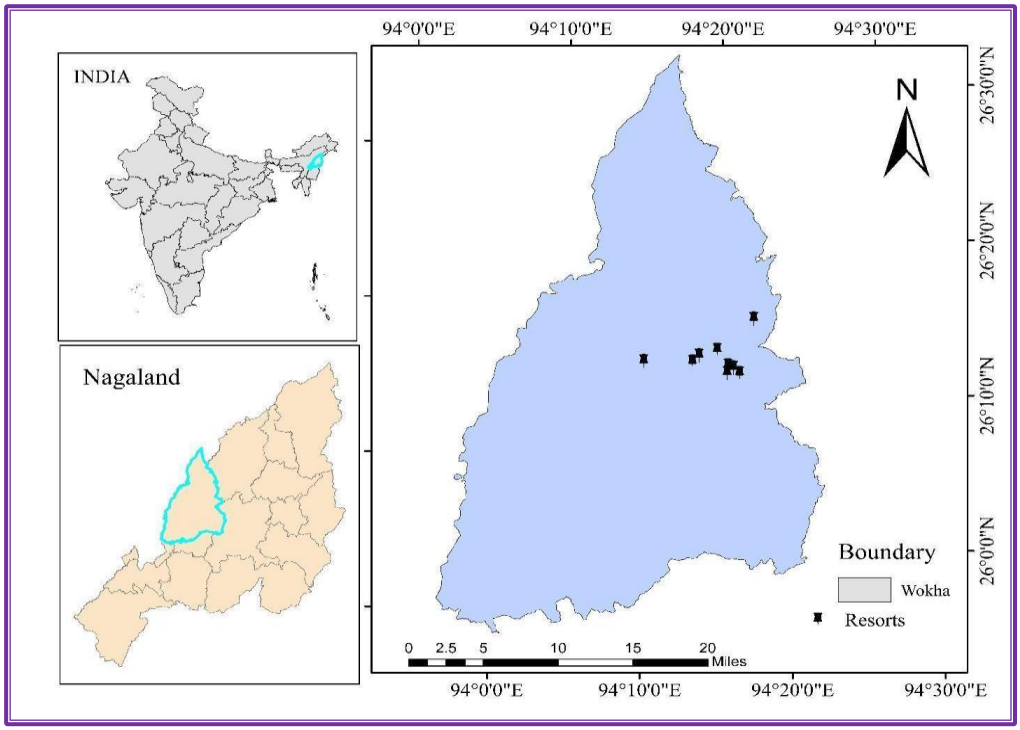


Figure 1: *Map Showing Ecotourism Spots Around Doyang Reservoir*



Figure 2 (A-D): *Panoramic View of Doyang Reservoir*

Table 1: *Notable Attributes of the Doyang River*

Sl. No.	Attribute	Details
1	Length	~150 km (estimate); up to 167 km (stretched)
2	Origin	Japfu Hill
3	Flow (Course)	Kohima—Phek—Zunheboto—Wokha—Assam
4	Tributaries	Tsui, Tullo, Tishi, Chubi, and Nzhu.
5	Mainstem/Parent River	Dhansiri-Brahmaputra
6	Hydroelectric dam	75 MW Doyang Hydroelectric Project
7	Uses/Importance	Irrigation, fishing, agriculture, and local culture.
8	Archaeological significance	Doyang-Dhansiri Valley artifacts site.

Research Design and Data Collection

A semi-structured questionnaire was used to collect primary data from 15 respondents, namely owners of resorts and recreation centers, village elders, and residents. Data were also complemented with formal and informal oral communication and field visits. Eight more people residing in the reservoir-fringe villages (Pangti, Asha, and Sungro) were interviewed using snowball sampling techniques. The interviews provided information on ecotourism sites, types of festivals and events, and the river's traditional heritage. The study interviewed 23 respondents aged 25 to 65.

Results

Major Ecotourism Sites around Doyang Reservoir

The study area is home to numerous sites with potential for sustainable ecotourism. These sites preserve local ecosystems and contribute to the livelihoods of their communities. Several riverside locations are available for birdwatching, boating, trekking, camping, and cultural exchanges. Table 2 highlights nine important ecotourism locations around the reservoir. Representative views of the reservoir landscape and tourism facilities are shown in Figures 2–6

***Table 2:** Prominent Ecotourism Spots Along the DoyangReservoir*

Sl. No.	Ecotourism Spots	GPS Coordinates	Address
1	My Resort	26.21950103°N, 94.30230163°E	Aree New, Nagaland 797100
2	Phodong Resort & Recreation Center	26.2136968°N, 94.3054071°E	Tsuza Eryui, Doyang Hydro Project, Nagaland 797111
3	Falcon Creek Doyang	26.2357267°N, 94.2072291°E	Doyang Hydro Project, Nagaland 797100
4	Jordan Ripples	26.2371111°N, 94.2866111°E	Unnamed Road, Yimpang, Nagaland 797100
5	The Woods Cottage	26.2393442°N, 94.2686252°E	Sunglup, Nagaland
6	ELI Camping Site	26.21421531°N, 94.30496976°E	Tzuza Eryui, Doyang Hydro Project, Nagaland 797111
7	Doyang Hydro Electric Project Power Station	26.2315833°N, 94.2617222°E	Doyang Hydro Project, Nagaland 797111
8	Amur Falcon Watch Tower	26.2681352°N, 94.3319508°E	Wokha, Nagaland 797100
9	Old Watch Tower	26.2219357°N, 94.3028226°E	Aree New, Nagaland

Ecotourism sites in the Doyang Reservoir have high biodiversity and are essential to the development of river-based ecotourism in the region, serving as both nature-based and cultural sites. The following are descriptions of the important ecotourism sites near the Doyang Reservoir.

My Resort

It offers visitors a sustainable, immersive, and engaging tourism experience. The resort (Figure 3: A) focuses on using locally available organic foodstuffs, offering nature-based activities, and providing ecological accommodations. In addition to showcasing the tranquil beauty of the surroundings, this approach promotes responsible tourism practices, which are integral to sustainable tourism principles.

The Woods

One of the oldest homestays is situated on the edge of the Doyang River in Pangti village. A homestay in an eco-friendly two-story timber-and-bamboo cottage offers tourists a fascinating panoramic view of the Doyang reservoir and its surroundings. The Woods (Figure 3: B) provides basic cottages and rents tents that can be set up near the homestay and the river. The Woods is an example of a sustainable ecotourism project and is considered a suitable ecotourism module for river-based ecotourism in the study area.

Phodong Resort & Recreation Centre

This charming and eco-friendly resort (Figure 3: C) is the perfect place to enjoy a range of activities, including nature walks, fishing, traditional cuisine, boating, and bird watching. Visitors and tourists can enjoy a memorable experience at the resort with its combination of outdoor adventures, traditional cuisine, and live-in log-and-bamboo huts.

Falcon Creek Doyang

There is no better offbeat holiday destination for adventure lovers and nature lovers than Falcon Creek Doyang (Figure 3: D-F). It is located near the small raptor bird that shares its name, the Amur falcon, and is an ideal place for birdwatching, nature trails, and photography. Furthermore, it is a great place for tourists interested in the area's aquatic ecosystem and biodiversity.



Figure 3 (A-F): *Homestay near Doyang Reservoir. A: My Resort, B: The Woods, C: Phodong Resort & Recreation Center, D-F: Falcon Creek Doyang*

Jordan Ripples

This location (Figure 4: A) would be an ideal setting for those who love nature, adventure, and the variety of outdoor activities it offers, including fishing, boating, hiking, bird watching, and other wildlife experiences. It is an ecotourism attraction where tourists and visitors can experience a range of activities, from excitement to relaxation, in an environmentally responsible way.

Eli Camping Site

It is located near TsuzaEryui and is a perfect spot for an ecotourist who wants to be close to nature. Eli Camping Site (Figure 4: B-D) offers tourism opportunities of responsible camping, wildlife viewing, and guided eco-tours. The focus is on sustainable engagement with the environment through quiet immersion, creating a space for nature lovers.

Doyang Hydroelectric Project Power Station

Doyang Hydroelectric Project Power Station (DHERP), with an installed capacity of 75 MW (3 x 25 MW generating units), is the only major hydropower project in Nagaland connected with the local grids and contributes to the NER (North Eastern Region) energy mix. It was commissioned in 2000 by the North Eastern Electric Power Corporation (NEEPCO). The facility is mainly used for utilities but is also offered as an ecotourism site for the educational value of hydropower generation, sustainability, and the environment. With a height of 92 m and a length of about 300 m, the Doyang dam provides much-needed secondary benefits, including irrigation and fisheries. Visitors, tourists, and students can participate in learning opportunities about the positive impacts of renewable energy projects on local ecosystem conservation.



Figure 4 (A-D): *Homestay near Doyang Reservoir. A: Jordan Ripples, B-D: ELI Camping Site*

Amur Falcon Watch Tower

The watchtower (Figure 5: D) is a part and parcel of the region's tourism, particularly for birdwatchers. The tower is an ideal place to see one of the most spectacular migratory bird events in the area. The denizens who do can enjoy “ethical birding” and help promote bird conservation.

Old Watch Tower

Furthermore, the study area is a famous destination for the “Amur Falcon Capital of the World,” and the tower (Figure 6: D) can serve as a platform for birdwatchers and bird lovers not only to see the bird but also to engage in educational and sustainable bird protection and conservation tourism.



Figure 5: *A: Park Area, B: Picnic Spot, C: Nature Walk, D: Amur Falcon Watch Tower, E: Doyang Dam*



Figure 6: *A: Camping Site, B: Tree House, C: Games and Sports Area, D: Old Watch Tower, E: Doyang View Point, F: Volleyball court, G-H: Boating*

Emerging and Prospective Ecotourism Sites

Apart from the locations identified above near the reservoir, there are other places showing potential for future ecotourism development. These places are important for generating income and maintaining biodiversity, two goals of ecotourism.

Pangti, Asha and Sungro Villages

Globally important roosting sites of the Amur Falcon are Pangti, Asha, and Sungro villages along the Doyang River in the Wokha district of Nagaland. Once renowned for their hunting prowess, the communities have now become conservation champions, earning global recognition for their successes. The villages are where thousands of raptors stop during their 15,000-mile annual migration from the Amur region of Russia to Southern Africa, and each autumn they attract researchers, birdwatchers, and photographers. Ecotourism has grown through guided tours, homestays, and cultural programs that provide sustainable livelihoods. Today, the hunters are the keepers of the area and act as guides for tourists, a testament to conservation through community effort. Recently, Pangti Village set up a guest house with the help of the Wildlife Trust of India to further the cause.

Mount Morashen and New Riphyim Village

Mount Morashen, with its characteristic prayer towers, and New Riphyim Village: An unmissable place, particularly for trekkers and nature lovers. The tower, gracefully positioned at the top, offers a stunning panoramic view of the surrounding landscape, the vast expanse of the Doyang River, and the dam below. Moreover, New Riphyim village is a poster child for right-minded ecotourism, as its farming practices have been remarkably reformed by reducing the controversial slash-and-burn (jhum) practice by more than half. The result of all those was a drastic change due to combined efforts, namely, community awareness and spontaneous (voluntary) participation in transition opportunities, if possible, in integrated farming systems, and the promotion of organic agriculture, composting, and other alternative means of self-employment, such as mushroom cultivation. All of these positive initiatives have garnered the interest of prestigious organizations, including UNESCO, in joining the Man and Biosphere (MAB) program.

Doyang Tourist Resort

The resort sits on a surrounding hill that overlooks the lush green mountains and the majestic expanse of the Doyang River from the reservoir. Furthermore, the resort has several facilities for tourists and visitors to enjoy and experience nature. It is equipped with a tourist reception center, indigenous log huts, and a cafeteria that offers a traditional culinary experience and delight. Additionally, visitors can enjoy birdwatching one of the world's most spectacular flocks of the highly active migratory raptor, the Amur falcon (*Falco amurensis*), during its stopover at the study site. This is regarded as one of the longest of any raptor's migratory paths that takes it from its breeding grounds in the Amur River region of Russia to its wintering grounds in the southern part of Africa (Dutta *et al.*, 2025).

Angling Festivals and Cultural Events

As Doyang Reservoir has a variety of fish and a large population, it is now playing a major role as a venue for organizing various fish-based angling festivals and other cultural events. The latest Annual Hornbill Angling Festival 2024 was organized by the Anglers Association of Nagaland (AAN) and hosted by District Anglers Wokha Nagaland (DAWN) and held at the reservoir in December 2024, with the participation of as many as 253 anglers. Moreover, Nagaland is gaining popularity as an angling destination, with more than 350 participants taking part in the 5th Nagaland State Angling Competition in September 2024, both from outside and within the state. Additionally, in February 2025, the reservoir hosted the Doyang Folk Festival, featuring cultural elements such as music, crafts, folklore, and dance. In 2021, traditional and acoustic music were also blended and performed in the

Doyang Music Festival to celebrate the cultural heritage. All the events aim to promote ecotourism sustainably, linking sport, culture, and nature in the study area.

Discussion

This study exemplifies the potential to promote river-based ecotourism in Nagaland, with particular reference to the Doyang reservoir. Nagaland already boasts a wealth of natural sites for ecotourism development (Borah, 2019; Verma, 2024). This is exemplified by several instances in the state, such as Khonoma Village, tagged as 'Asia's First Green Village,' which showcases a community-led ecotourism model that combines cultural preservation with biodiversity conservation. Similarly, the scenic Dzukou Valley promotes responsible tourism and biodiversity conservation by integrating trekking, camping, and adventure with waste management programs (Kinny &Lanusosang, 2016). The latter can be seen as examples of community stewardship, participation, and governance that support sustainable tourism, conservation, and livelihood objectives (Luc *et al.,* 2026). Nagaland has tremendous scope for the development of fisheries-based ecotourism, especially in the reservoir area, which can provide a range of cultural, traditional, socio-economic, and ecological benefits. With a focus on sustainable practices and responsible tourism, Nagaland has the potential to tap into the growing global demand for eco-friendly travel experiences (Borah, 2019). The Doyang reservoir in the district of Wokha, Nagaland, is essential for irrigation, local fisheries, and hydroelectric power generation.

Furthermore, it can host various fish species, such as Rohu, Catla, and Mahseer, which help preserve traditional livelihoods and the ecosystem (Ezung *et al.*, 2022; Pongen & Pankaj, 2026). The ecotourism events in the reservoir, including camping, boating, angling, and wildlife viewing, have steadily increased and demonstrate a culture of relationships with the natural and cultural resources. Birdwatchers will enjoy the chance to visit hinterland villages such as Sungro, Pangti, and Asha, where Amur falcons gather along the reservoir fringe. Also, Mount Morashen Tower is a great place for sightseeing and trekking for nature-loving tourists.

In addition, the state is endowed with a wealth of cultural resources, and there are several indigenous tribes with whom to engage in cultural exchange. Additionally, the diverse tribal festivals and fishing rituals of the communities offer tourists and visitors the opportunity to witness the Nagas' heritage. On the contrary, pressures from overfishing, plastic pollution, the use of synthetic fish poisons, dynamite fishing, infrastructure development, and environmental degradation pose a serious threat to the sustainability of these ecosystems and their resources (Kechu & Pankaj, 2023). In light of the above, it is imperative to adopt and expand the potential scope of river-based ecotourism in the region as an alternative to promote biodiversity and cultural preservation (Pathmanandakumar, 2017). In contrast, 'ecotourism with conservation via people's participation' in the study area is critical for economic development and ecosystem conservation. Moreover, it will promote better management of the precious fish resources and help preserve the reservoir's aquatic ecosystems. Moreover, it will generate opportunities for the associated communities, providing a way out of dependence on aquatic resources and replacing their destructive practices with sustainable approaches (Kumar & Shobana, 2025). There is a need for coordination between various stakeholders in the development of river-based ecotourism. Local communities agree on community-led projects and equitable benefit sharing, while government bodies emphasize supportive policies, infrastructure, investment, and incentives for private-sector participation (Kumar & Shobana, 2023). Integrating local people's knowledge of resource management into ecotourism planning can also bolster local culture and further enhance sustainable practices (Prasetyo *et al.,* 2020). The aim of this study is also to highlight collective planning and strong local participation in decision-making. Awareness and capacity-building sessions are pivotal in promoting sustainable tourism to safeguard the equitable distribution of tourism benefits (Hanai & Espíndola, 2011). The World Tourism Organization (WTO) reminds us of the importance of achieving sustainable tourism, an ongoing process in which impacts need to be continuously monitored and appropriate preventive and/or corrective actions taken.

The potential for river-based ecotourism in Nagaland is significant, given the state's rich cultural heritage, biodiversity, and natural beauty, which can help sustain local livelihoods while attracting tourists. As more tourists seek eco-friendly travel experiences, this approach has the potential to contribute significantly to the state's sustainable growth and economy.

Challenges to Sustainable Ecotourism Development around Doyang Reservoir

Lack of Basic Infrastructure

Even in the Doyang reservoir region, which is rich in natural resources and has incredible ecotourism potential, the lack of basic infrastructure hinders the provision of services to meet tourists' needs. This, in turn, negatively impacts the development of the sustainable tourism sector.

Road access is one of the key challenges that exist for ecotourism sites around and within the Doyang reservoir, especially for transporting tourists. The photographs clearly illustrated the area's pastoral landscape and the poor maintenance of the road network in some places, making travel during the monsoon season impossible. Thus, the lack of proper road maintenance poses a problem, particularly during the monsoon, when tourists from Nagaland and neighboring states are unable to easily access some key ecotourism sites (Ezung, 2011).

Accommodation and Visitor Facilities

There are only limited accommodation options, and a few eco-resorts, such as My Resort and Phodong Resort & Recreation Center, provide basic facilities for ecotourists. However, there are no overnight accommodations for visitors, and no proper visitor facilities, such as restaurants, information centres, or sanitary facilities, are available, so the number of visitors that can be accommodated is limited. Improving its existing utilities, along with new ecotourism facilities such as homestays, could enhance the tourism experience and positively impact the local economy (Kinny & Lanusosang, 2016; Ezung, 2011).

Environmental Management and Waste Pollution

Strengthening environmental management at ecotourism sites is needed, while the region's natural beauty and cultural heritage are assets for attracting visitors. Other sites, such as the Doyang Hydroelectric Project Power Station, also offer important educational and tourism events and excursions related to renewable energy. However, the need for strong management guidelines that consider visitor impacts and waste management to maintain ecological balance and sustainable tourism remains. It is essential to promote awareness initiatives on wildlife conservation, water management, and waste disposal to preserve the region's ecological balance and stability (Okazaki, 2008). There are significant concerns about the health of aquatic ecosystems and freshwater quality in the Doyang reservoir due to the deposition of plastic waste, floating debris, and logs brought by the upstream tributaries. The implementation of the second phase of the ‘Clean Doyang Mission' by the Wokha district administration in August 2024 and August 2025 is significant here, as it has led to increased pollution and spurred a focused drive to restore ecological balance and protect community welfare. This, in turn, leads to plastic pollution diminishing the allure of ecotourism by degrading scenic splendor and biodiversity and jeopardizing fisheries by deteriorating fish health and reducing catches.

Tourism Promotion / Stakeholder Coordination

Another issue is the successful promotion of tourism. There is a need to launch an awareness campaign to create a viable ecotourism destination in the region, to be undertaken by stakeholders—development agencies, tourism operators, country owners of the region, and NGOs—in a synergistic manner. While growing, it participates in activities that support local governments and community-led tourism development projects by addressing infrastructure issues and equitably distributing tourism benefits (Okazaki, 2008).

The Expansion of Ecotourism is Not Adequately Controlled

More visitors than can be accommodated leads to misuse of natural resources and ecosystem functioning, increased water contamination, waste accumulation, disturbance of local flora and fauna, and depletion of long-term ecological capacities (Buckley, 2012). Such is the pressing issue with ecotourism sites in sensitive ecological areas, such as the Doyang reservoir.

Socio-cultural and Economic Concerns

The commercialization of traditional culture for tourism may lead to the disintegration of authentic local practices, resulting in cultural decline. The exploitation of indigenous communities particularly jeopardizes the equitable distribution of ecotourism profits, and this concern must be meticulously addressed to prevent the ongoing widening of socio-economic disparities (Tosun, 2000; Scheyvens, 1999). Besides, if local communities are incompetent, they may fail to use the resources provided by tourism initiatives, thereby making them inefficient participants in sustainable tourism practices.

Climate Change and Ecotourism Sustainability

Over the years, climate change has adversely disturbed the sustainability of river-based ecotourism. This long-term hazard associated with changes in river flow, weather, and extreme weather can impact aquatic populations and ecosystems (Borah, 2021). It can be viewed as a precursor to indigenous fishing or ecotourism opportunities. Environmental changes can affect residents' livelihoods and reduce the tourist appeal. In light of this, it is relevant to address this problem by actively implementing adaptive measures for climate action (Phillips & Pérez-Ramírez, 2017) to reduce such risks potentially.

Strategies and Ways Forward for Sustainable River-based Ecotourism

The Doyang Reservoir area has great potential for river-based ecotourism; however, some issues must be resolved, including improved environmental management, infrastructure development, and cooperation among stakeholders. By tackling these challenges, Nagaland can strive to build a sustainable ecotourism model that benefits the environment and enriches the lives of its local community. The following strategies are recommended to achieve these goals:

Collaborative Governance and Stakeholder Synergy

Sustainable river-based ecotourism at the Doyang reservoir needs a collaborative approach to sharing the river among various stakeholders, as has been done in the Community Conserved Areas (CCAs) of Nagaland, which has improved biodiversity conservation and livelihoods (Sethi, 2018).

Community-led Development of Ecotourism

Traditional fishing communities hold indigenous ecological knowledge, which is vital for community-based tourism development and the management of sustainable fisheries (Prasetyo *et al.,* 2020) in Doyang. Empowering the local community through hospitality, guiding them in managing ecotourism, and demonstrating that ecotourism benefits remain within the community is key to local community leadership.

The Role of NGOs and Conservation Organizations

These organizations play a pivotal role in unifying and providing valuable expertise in site management; also, including the conservation objective when assessing the impacts of tourism in the Doyang reservoir is of paramount importance. In conjunction with this initiative is the transition towards ensuring ecological security and enhancing the visitors' experience (Das & Chatterjee, 2015).

Policy Support and Government Intervention

It seems pragmatic to adopt collaborative governance at the Doyang Reservoir, where government, communities, NGOs, and tourism operators are involved in decision-making. However, there is a need for consistent monitoring, feedback, and adaptive strategies. This approach has proven to be an exceptional success in linking tourism's economic growth to conservation efforts and has also

generated additional benefits for the community (Bramwell & Lane, 2011). It can help protect equitable revenue sharing, depending on the Sustainable Development Goals, by bringing about changes in the government sector in the form of policy frameworks such as the Nagaland Tourism Policy 2024, Tourism Activities Regulation, Infrastructure Investment, Natural Resources Protection, creating incentives for the private sector, etc., to champion the ecotourism development of the Doyang reservoir (Borah, 2019).

Nagaland's fisheries-based ecotourism can contribute to sustainable development, provided we manage infrastructure, environmental, and equity issues effectively. Good governance and stakeholder involvement are essential for equitable distribution, the incorporation of local knowledge, and sustainability in the interests of communities and the environment.

Capacity Building and Awareness Programs

Promoting sustainable ecotourism in the Doyang River requires community participation, coupled with capacity-building and awareness programs. Considering the exponential spread of river pollution in such fragile areas, training local communities in resource conservation, responsible tourism practices, and eco-friendly livelihood activities can help protect the river ecosystem (Ambusaidi *et al.,* 2024). Activities such as the recent awareness-cum-river ranching initiatives at Doyang have substantially encouraged community participation in sustainable resource management. Responsible tourism and biodiversity conservation are key foundations for sustainable ecotourism (Ashok *et al.*, 2017).

Limitations

The cardinal lacuna of the present investigation was that it solely focused on the physical potential and feasibility of ecotourism; hence, it does not reflect the long-term economic viability of such ventures. Additionally, the study was also geographically concentrated on Doyang Reservoir and its associated communities, which may limit the generalizability of the findings to other river- or reservoir-based destinations.

Future Scope

The study warrants greater research capacity, specifically focusing on economic assessments such as cost-benefit analysis, revenue projection, and willingness to pay to gain a better, comprehensive understanding of the economic feasibility of such avenues. Furthermore, studies on tourists' perceptions, preferences, expectations, and willingness to participate in ecotourism activities in the study area would give a definite impetus to assess the socio-economic feasibility.

Conclusion

This study shows that river-based ecotourism at Doyang Reservoir can support the sustainable development of Nagaland by integrating conservation with alternative livelihoods. Ecotourism can support local income generation through activities such as birdwatching, trekking, and fishing, leveraging the region's biodiversity, cultural heritage, and traditional fishing practices. Challenges related to inadequate infrastructure, environmental threats, and cultural exploitation need to be addressed to ensure success. Collaboration between stakeholders, sustainable tourism practices, capacity building, equitable benefit-sharing, and continuous monitoring will be required to achieve sustainable outcomes. Switching from extractive industries to resource-based tourism can serve the purposes of biodiversity conservation, cultural identity protection, and local economic improvement. Doyang's approach dovetails with multiple United Nations Sustainable Development Goals and makes Doyang an ideal example for balancing environmental and economic development in the State of Nagaland.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgment

The authors are grateful to the local communities and respondents of the Doyang Reservoir area for their cooperation and valuable support during the study. PPP gratefully acknowledges the financial support received from ICAR-National Bureau of Fish Genetic Resources, Lucknow.

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