The Environmental Impacts of Wetland Tourism: A Study of Chilika Lake in Odisha

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Abstract

Wetlands have emerged as major nature-based tourist destinations throughout the world. As tourist hotspots, wetlands help in boosting the local economy and positively contribute to the economic wellbeing of the local residents, particularly of those involved in various tourism-related activities. However, tourism, if not well managed, can lead to various adverse environmental impacts, thereby affecting the lives and livelihoods of the local people. The paper seeks to study the major environmental impacts of tourism in Chilika wetland and identify the key factors contributing to those impacts. The research is based on primary study and the results of the study are assessed through frequency, mean and factor analyses.

Keywords- Wetland, Wetland tourism, Chilika lake, Environmental impacts, Pollution

1. Introduction

Wetlands are one of the most productive ecosystems in the world and are one of the major tourist attractions. Wetlands provide a wide array of services to the local community, starting from supplying food, water, construction material, protecting the coastline to providing the facility for leisure and tourism activities (UNWTO, 2012). Though there are many definitions of wetland, provided by various authors, the Ramsar convention's definition is a universally accepted one. According to the Ramsar convention, wetlands are the "areas of marsh, fen, peatland or water, whether artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including the marine water, the depth of which at the low tide does not exceed six meters".

The unique features like rich biological diversity, natural environment, wilderness, coastal villages etc. make wetlands, nature-based tourism destinations, that offer leisure, recreation and tourism facilities (Chiu et al., 2014). Wetland tourism attracts a great number of tourists. Millions of tourists visit the wetland destinations in Asia annually (Cheung and Fok 2014). The 11th conference of the Ramsar Convention, held in Bucharest, Romania in 2012 had formally acknowledged the relationship between wetland and tourism, while highlighting several ecological challenges associated with wetland tourism. The conference suggested the adoption of sustainable tourism to address the adverse ecological impacts of wetland tourism.

Tourism in wetlands can bring both positive and adverse environmental impacts. It can generate employment opportunities for the local residents and enhance their income and living standards. Increased income from tourism in the form of entry fee, user fee and sale of local products etc. can in turn be used for long term conservation of nature in and around the wetlands. The earnings from tourism can be used to train the local guides and tour operators to explain and guide the tourists on simple conservation measures and also modifying their own operations so as to minimize the damage to natural resources. Tourism can empower local communities, provided the gains from tourism are fairly distributed in the community which can incentivize the local residents to conserve the natural habitat (Egresi et al., 2021).

However, tourism, if not well managed can have serious adverse impacts particularly on environmentally sensitive ecosystems such as wetlands. Excessive and rapid development of tourism infrastructure and increasing inflow of tourists around wetlands can put enormous pressure on local resources, lead to loss of natural habitats, deforestation, soil erosion, increased air, water and noise pollution, and adverse impacts on the endangered species.

Chilika is the largest brackish water lagoon of Asia situated in Odisha, on the East coast of India. The lake covers a huge area of 950 square kilometers in summers that increases to 1165 square kilometers during the rainy season (Siddiqui & Rama Rao 1995). It is spread across three districts of Odisha namely Puri, Khordha and Ganjam. The lake is a highly productive ecosystem and has a rich fishery resource. There are 323 types of fishes found in the lake, out of which 261 are finfish species, 28 belong to the category of prawns and 34 to the category of crabs (Chilika Development Authority,2008). Due to its rich fishery resources, more than two lakh people depend on the lake for their livelihood (Nayak and Baker,2010). The lake was designated as a Ramsar site in the year 1981 due its rich biodiversity and socio-economic importance. Irrawaddy Dolphin, which is one of the endangered species, is found in this wetland. It is considered to be the flagship species of the lake and hence a major attraction for tourists. Chilika wetland offers the largest wintering ground to the migratory birds on the Indian subcontinent. According to the bird census report, 2024, Chilika was visited by 1,137,759 feathered tourists, belonging to 184 species (Down to Earth). A number of beautiful islands spread across the lake. The wetland offers a wide array of tourism attractions, such as bird watching, dolphin cavorting, boating, visiting Goddess Kalijai, and a chance to savour the delicacies such as brackish water fish, crab and prawn (Khuntia, 2017).

2. Objectives

- To study the environmental impact of tourism in Chilika lake.
- To identify the key factors contributing to various environmental effects of tourism in and around Chilika lake.

3. Review of Literature

Tourism brings both positive and adverse impacts to the host community and nation which can be classified into environmental, economic and socio-cultural impacts (Simson,2008). Rampel (2009) who has conducted a study on causal link of coastal tourism on Vancouver Island has identified several key positive impacts such as wildlife conservation, increased employment opportunities for the youth, fostering environmental stewardship and enhancing beautification of the area.

According to Ko and Stewart (2008) tourism affects the host community in a number of ways, such as protection of natural resources, improvement of public amenities, increased traffic congestion and accidents, noise and air pollution etc. Ikiara and Okech (2002) have found that, though tourism protects the flora and fauna and their natural habitat, it also can lead to severe negative impacts on the environment if not properly controlled and managed. These include overcrowding, overdevelopment of tourist attractions, pollution of coastlines and destruction of coral reefs and mangroves etc. Chuang (2013) conducted a comparative study of Nanjuang and Tongsiao township in Taiwan and found that Nanjuang residents have faced increasing environmental impacts associated with tourism such as noise pollution, destruction of environment due to the construction of more hotels and tourist facilities, increased production of garbage, increased traffic congestion and accidents etc. Mbaiwa (2003) through his study on socio-economic and environmental impact of tourism in Okavango delta in north Botswana found that tourism is responsible for many ecological issues such as loss of habitats, flora and fauna, degradation of natural beauty, increased waste and noise pollution. Zhao and Li (2018) through their study in China, found that while tourism increases the environmental awareness and develops the infrastructure facilities, it is also responsible for increasing pollution and excessive energy consumption. Tourism growth in wetlands brings a number of negative impacts such as waste generation, water pollution and habitat destruction (Pan et.al.,2018). Khoshkam, Marzuki & Mulali (2016) based on their study on the Anzali wetland of Iran conclude that tourism brings many economic and socio-cultural developments to the destination while at the same time being responsible for environmental degradation in the wetland area.

4. Materials and Methods

The research involves primary study, based on survey methods. Data was collected from the local residents, directly involved in tourism activities in and around the lake through structured questionnaires. The stratified random sampling method was used for the collection of data and the total sample size for the survey was 106. The five-point Likert's scale is being used to measure the perceptions of residents on the environmental impacts of tourism in Chilika wetland. Data analysis was done with the help of SPSS software.

5. Results and Discussions

5.1 Demographic Profile and the Frequency Analysis

The demographic profile of the respondents is analysed with the help of Frequency analysis presented in table-1. The table shows that most of the respondents (83%) are male while only a small percentage (17%) are women. The age wise distribution reveals that the respondents belonging to the age group 31-40 years have the highest participation in tourism services followed by the age group of 21-30 years. It can therefore be inferred that tourism in Chilika overwhelmingly employs a younger population.

From the education profile, it can be concluded that the residents who are providing tourism services in Chilika wetland are educated. The occupational distribution of the respondents shows that 36.8% are engaged in guiding, 9.2% are engaged in selling souvenir products, 12.3% are engaged in restaurants/hotels/bars, 7.5% own shops for tourists, while 26.4% are providing boat services in the wetland area. So, it can be concluded that majority of the local people engaged in the tourism sector are providing guiding and boating services in Chilika wetland.

Table 1. Demographic Profile of the Respondents

Variable	*Category*	*Percent*
Gender	Male	83
	Female	17
Age Group	>20 years	3.8
	21-30 years	27.4
	31-40 years	35.8
	41-50 years	21.7
	Above 50 years	11.3
Educational Qualification	Up to High school	35.8
	Intermediary/Diploma	22.6
	Graduate	29.2
	Post-Graduate/Professionals	12.4

Occupation	Guiding	36.8
	Selling souvenirs	9.5
	Working in restaurants/hotels/bars	12.3
	Working as travel agents	7.5
	Owning shops for tourists	7.5
	Providing boat services	26.4

5.2 Mean analysis of Environmental impact

The simple mean analysis is used to evaluate the perception of local people on the environmental impacts of tourism in Chilika wetland. The respondents were asked to rate their perceptions using a five-point likert scale.

Table 2. Mean Analysis of Environmental Impact

	Mean	*Rank*
Chilika tourism cares for the environment and makes the area look better.	3.43	XI
Chilika tourism helps in protection and preservation of nature and natural resources.	3.55	VIII
Chilika tourism conserves natural resources.	3.48	IX
Chilika tourism creates environmental awareness.	3.83	II
Chilika tourism contributes to improving the environment for resident's living.	3.46	X
Tourism is an integral part of the locality.	4.31	I
Chilika tourism contributes to the excessive consumption of water.	3.00	XVI
Tourism in Chilika pollutes the water.	3.01	XV
Tourism in Chilika creates noise pollution.	3.20	XIII
There is an increase of untreated garbage due to tourism.	3.61	V

Local people have a lower quality of life in the Chilika area.	3.12	XIV
Chilika tourism pollutes the sanctuary environment.	3.59	VI
There is traffic congestion during peak tourism periods in Chilika lake	3.72	IV
Chilika Tourism creates more road accidents.	2.58	XVII
Chilika tourism increases littering.	3.79	III
The bird population is fluctuating due to increasing number of tourists	3.28	XII
The habitat of dolphins is greatly disturbed due to the increasing number of tourists	3.58	VII

The mean analysis from table-2 shows that the mean value is more than 3 in the 5-point Likert scale for all the above variables/perceptions except for one where residents disagree with the perception that tourism in Chilika creates more road accidents (mean value of 2.58). This implies that respondents perceive that tourism in Chilika has profound environmental impacts. Respondents believe that tourism is an integral part of the locality (4.31) while also perceiving that tourism in the lake increases littering (3.79), leads to traffic congestion (3.72), increases untreated garbage (3.61), pollutes sanctuaries (3.59) and disturbs the habitats of the dolphins (3.58). Thus, it can be concluded that tourism in the lake results in adverse environmental effects in and around the lake.

5.3 Factorization of Environmental impact
The factor analysis is used to study the environmental impacts of tourism in Chilika lake.

Table 3. Perception of the Respondents towards Environmental Impacts: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.765
Bartlett's Test of Sphericity	Approx. Chi-Square	1.089E3
	Df	136
	Sig.	.000

From table-3, the KMO value of 0.765 being greater than 0.60 indicates that data is acceptable for the factor analysis. The substantial value of Bartlett's test of Sphericity approves that there is a fundamental association between the original variables and are adequately fit for factor analysis.

Table 4. Perception of the Respondents towards Environmental Impacts: Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.190	36.411	36.411	4.160	24.472	24.472
2	2.603	15.314	51.724	2.710	15.939	40.411
3	1.694	9.966	61.691	2.434	14.315	54.726
4	1.178	6.929	68.620	2.362	13.894	68.620
5	.967	5.688	74.308			
6	.849	4.997	79.305			
7	.706	4.155	83.460			
8	.514	3.025	86.484			
9	.455	2.674	89.158			
10	.413	2.429	91.587			
11	.322	1.897	93.483			
12	.280	1.647	95.130			
13	.229	1.347	96.477			
14	.202	1.187	97.665			
15	.169	.994	98.658			
16	.137	.804	99.463			
17	.091	.537	100.000			
Extraction Method: Principal Component Analysis.						

From table-4, four factors have been extorted whose Eigenvalues are greater than 1 and the total variance is 68.620 percent. The total variance explained by the 1st factor is 24.472% followed by 15.939%, 14.315% and 13.894% respectively. The remaining 13 statements are explained by 31.380% of the total variance. So, based on the Eigenvalues, four factors are sufficient to explain the 17 perceptions towards the environmental effects of tourism in Chilika and can be used for further analysis.

Table 5. Perception of the Respondents towards Environmental Impacts: Rotated Component Matrix

	Factor Title	Component			
		1	2	3	4
Chilika tourism helps in protection and preservation of nature and natural resources	Preservation	.888			
Chilika tourism cares for the environment and makes the area look better		.863			
Chilika tourism conserves natural resources		.841			
Chilika tourism contributes in improving the environment for resident's living		.812			
Chilika tourism creates environmental awareness		.730			
Tourism is an integral part of the locality		.700			
The habitat of dolphin is greatly disturbed due to increasing number of tourists	Habitat loss		.830		
There is a congestion during peak periods in Chilika lake			.770		
The bird population is fluctuating due to incrrasing number of tourists			.726		
Chilika tourism increases littering			.721		
There is an increase of untreated garbage due to tourism	Pollution and lower Quality of life			.811	
Local people have a lower quality of life in the environment in Chilika area				.782	
Chilika tourism pollutes the sanctuary environment				.606	
Chilika tourism adds to the traffic congestion and noise pollution				.442	
Tourism in Chilika pollutes the water	Water pollution and accident				.765
Chilika Tourism creates more traffic and accidents					.764
Chilika tourism contributes to excessive consumption of water					.604
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.					

The table-5 shows that five factors are extracted after Varimax rotation of 17 statements. The 1st factor comprises 6 perceptions, all related to conservation and preservation of the environment. Therefore, it is named as 'Preservation'. The second factor comprises 4 perceptions linked to the adverse impacts on habitats of species in and around the lake such as dolphins and birds and thus can be named as 'Habitat loss. The third factor comprises four statements related to pollution and its impact on the quality of life of the local people. So, it is named as 'Pollution and lower quality of life'. The fourth factor consists of perceptions associated with overuse and pollution of water, increasing traffic congestion and accidents and therefore is named as 'Water pollution and accident'.

6. Conclusions and Recommendations

Wetlands are one of the most productive ecosystems of the world which is very fragile in nature. Due to its rich flora and fauna and its enchanting natural beauty, wetland tourism is considered to be one of the most popular forms of tourism in the world. Chilika lake boasts a unique mix of fresh, saline and brackish water ecosystems with estuarine characteristics. Fresh water runoff from the inland rivers mixed with the saline water from the Bay of Bengal creates a unique and highly productive ecosystem inside the lagoon, supporting a rich biodiversity including some rare and endangered species like Irrawaddy dolphins. Additionally, the lake serves as a haven for migratory birds for breeding and feeding in its fertile waters during the winters. The lake is a major hub of tourism in India and one of the choicest destinations for ornithologists, bird watchers and naturalists. The findings of this study reveal that the local people who are providing various services to the tourists for their livelihood are mostly men, whereas a very small percentage of the women are engaged in the tourism sector. In order to make tourism more sustainable, the participation of women in the tourism sector should be encouraged which will not only help in the reduction of poverty but will also promote gender equality, two of the major sustainable development goals of the UN. The educational qualification of the respondents suggests that the least educated group has the highest participation in tourism activities and the largest share of the population engaged in tourism are youth, engaged predominantly in guiding and boating services for the tourists. The mean analysis and factor analysis result show that tourism is an integral part of the local community. Though tourism contributes to the preservation and conservation of the environment, it also pollutes the water and air, creates traffic congestion, generates waste, creates noise pollution, disturbs the habitat of the animals especially dolphins and birds. The negative impacts of tourism outweigh the positive effects. In order to effectively address these adverse impacts and to make tourism more sustainable, the principles of sustainable tourism should be adopted. All the stakeholders including government, tourism department, local community, OTDC and various tourism service providers should come together and take appropriate steps to minimise the negative ecological impacts and make tourism in Chilika wetland more sustainable and rewarding for all. Sustainable tourism not only safeguards the ecosystem but also improves the economic health of the local community.

References

1. Attfield, R. (2006). *Environmental ethics and global sustainability.* Environmental ethics and international policy, 69-87.

2. Bull, W. B. (1991). *Geomorphic responses to climatic change*.

3. Ceballos-Lascurain, H. (1996). *Tourism, ecotourism, and protected areas: The state of nature-based tourism around the world and guidelines for its development.* Iucn.

4. Cheung, L. T., & Fok, L. (2014). *The motivations and environmental attitudes of nature-based visitors to protected areas in Hong Kong.* International Journal of Sustainable Development & World Ecology, 21(1), 28-38.

5. Chiu, Y. T. H., Lee, W. I., & Chen, T. H. (2014). *Environmentally responsible behavior in ecotourism: Antecedents and implications.* Tourism management, 40, 321-329.

6. Chuang, S. T. (2013). *Residents' attitudes toward rural tourism in Taiwan: a comparative viewpoint.* International journal of tourism research, 15(2), 152-170.

7. Egresi, I., Prakash, S. L., Maduraperruma, B., Withanage, A., Weerasingha, A., Dezsi, Ş., & Răcăşan, B. S. (2021). *What affects support for wetland tourism? A case study from Sri Lanka.* Sustainability, 13(16), 8802.

8. Finlayson, C. M., & Van der Valk, A. G. (1995). *Wetland classification and inventory: a summary.* Vegetatio, 118, 185-192.

9. Ikiara, M., & Okech, C. (2002). *Discussion Paper No. 19 of 2002 on Impact of Tourism on Environment in Kenya: Status and Policy.*

10. Inskeep, E. (1991). *Tourism planning: An integrated and sustainable development approach.* Van Nostrano Reinhold.

11. Kerstetter, D. L., Hou, J. S., & Lin, C. H. (2004). *Profiling Taiwanese ecotourists using a behavioral approach.* Tourism management, 25(4), 491-498.

12. Khoshkam, M., Marzuki, A., & Al-Mulali, U. (2016). *Socio-demographic effects on Anzali wetland tourism development.* Tourism Management, 54, 96-106.

13. Khuntia, N. (2017) "*Sustainable Tourism Developments in Wetlands: A Study with reference to Chilika Lake, Odisha*" (PhD Thesis), Pondicherry University.

14. Ko, D. W., & Stewart, W. P. (2002). *A structural equation model of residents' attitudes for tourism development*. Tourism management, 23(5), 521-530.

15. Mbaiwa, J. E. (2003). *The socio-economic and environmental impacts of tourism development on the Okavango Delta, north-western Botswana*. Journal of arid environments, 54(2), 447-467.

16. National Birds Day 2024: Over a million birds belonging to 184 species visit Odisha's Chilika lake. (2024, January 05). DownToEarth. https://www.downtoearth.org.in/wildlife-biodiversity/national-birds-day-2024-over-a-million-birds-belonging-to-184-species-visit-odisha-s-chilika-lake-93727

17. Nayak, P. K., & Berkes, F. (2010). Whose marginalisation? Politics around environmental injustices in India's Chilika lagoon. Local environment, 15(6), 553-567.

18. Pan, S. Y., Gao, M., Kim, H., Shah, K. J., Pei, S. L., & Chiang, P. C. (2018). *Advances and challenges in sustainable tourism toward a green economy*. Science of the total environment, *635*, 452-469.

19. Ramsar, U. N. W. T. O. (2012). *Destination wetlands: supporting sustainable tourism*. In Secretariat of the Ramsar Convention on Wetlands, Gland, Switzerland, & World Tourism Organization (UNWTO), Madrid, Spain.

20. Rempel, J. M. (2009). *SUSTAINABILITY IN COASTAL TOURISM: PURSUING THE CAUSAL NEXUS*. Bridges/Tiltai, *47*(3).

21. Siddiqui, S. Z. (1995). *Limnology of Chilika lake*. Fauna of Chilika lake.

22. Simpson, M. C. (2008). *Community benefit tourism initiatives—A conceptual oxymoron?*. Tourism management, *29*(1), 1-18.

23. Zhao, J., & Li, S. M. (2018). *The impact of tourism development on the environment in China*. Acta Scientifica Malaysia, *2*(1), 1-4.