

Addressing Climate Change Loss and Damage: Promoting Ecotourism for the Sustainable Economic Development of Tribal Communities in Odisha

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ABSTRACT

The Odisha region of India is facing a major challenge of climate change that is threatening the lives and culture of tribal people in the region. Eco-tourism has been found to be a community based and sustainable strategy to mitigate these impacts and boost economic development and conservation of biodiversity. The research paper explores how eco-tourism has been utilized in two major tribal areas- Similipal, Mayurbhanj and Keonjhar by case study with secondary data and thematic analysis. The results indicate that eco-tourism helps in the adaptation to climate change through the adoption of sustainable land use, minimizing deforestation, and environmental stewardship. The level of community participation, particularly the grassroot initiatives at Keonjhar is central in the decent development and preservation of culture. Whereas Similipal has shown a state-based model which gives focus on the conservation process which is controlled, Keonjhar has shown a participatory model which is community owned. The two examples emphasize the potential of eco-tourism as a multi-faceted tool of ecological sustainability, cultural sustainability and economic empowerment. Nonetheless, infrastructure discontinuities, inaccessibility to the market and institutional barriers need to be overcome to ensure that its long-term benefits are maximized. The paper ends by giving policy intervention, capacity building and inclusive governance recommendations to enhance eco-tourism as a climate-resilient developmental option to Odisha tribal communities.

Keywords- Climate change, Tribal communities, Eco-tourism, Sustainable development, Cultural heritage, Community participation.

INTRODUCTION

The climate change is jeopardizing the livelihoods of the indigenous populations particularly tribal population in Odisha. The loss of biodiversity, alterations in weather patterns and destruction of forests and water resources have led to the disruption of their lives and economic activities. Eco-tourism has become a feasible approach towards reducing the effects of climate change and ensuring sustainable development of these communities. Eco-tourism can offer alternative sources of income, empower the local people, and generate a motivation towards the preservation of the environment by tapping the potential of the natural beauty and cultural abundance of the tribal areas of Odisha. Eco-tourism is concerned with conservation, sustainability and the community participation in the tourism industry. Eco-tourism offers tribal societies in Odisha a manna heaven opportunity to preserve their culture, to make money, and to take part in the global environmental activism. It is also highly crucial in alleviating the adverse impacts of climate change since it produces greater attachment among human beings to the surrounding.

Using eco-tourism as a means to promote sustainable economic growth and environmental conservation, the two famous eco-tourism projects in Odisha, Similipal National Park in Mayurbhanj and Keonjhar district, demonstrate how successful eco-tourism can be. Similipal national park, a habitat to diverse flora and fauna has been a biodiversity hot spot and eco-tourism projects have been put in place to promote sustainable tourism. Eco-tourism projects in Keonjhar have been successful in community empowerment of the tribal communities. Homestays and eco lodges are designed, tribal families offer lodging to tourists and they get a glimpse of the true nature of their culture and lifestyle. This participatory model will see to it that the benefits of tourism are shared and that a sense of ownership and responsibility towards environmental conservation are developed. Global issues The issue of climate change has become one of the most significant global issues of recent times. Its effects are not even. Among the most impacted is the indigenous and tribal community as they are the ones who are physically dependent on forests, land, rivers, and natural resources to live. The Indian state of Odisha consists of an enormous population of tribal residents, the life and culture of which is tightly linked with nature. Rises in temperatures, erratic rainfall, frequent droughts, floods, and loss of forests have put them into a high susceptibility and caused dire economic and social damages.

Loss and damage are a concept in climate change, which is linked to the damage that cannot be completely avoided by either adaptation or mitigation. To tribal communities in Odisha, this loss includes a decrease in the forest produce, reduced agricultural output, a lack of water, and a risk to the traditional knowledge systems. These ills can only be solved through solutions which are not only directed to environmental protection, but livelihood and dignity. It is thus necessary to have sustainable economic models that will help such communities to cope with climate stress and maintain their cultural identity. One of the solutions said to be sustainable is eco-tourism. It forms a connection between development and conservation. It enables tourists to enjoy nature in a sustainable manner and at the same time make certain that the locals are directly benefiting. Through good management, eco-tourism can help to restore natural ecosystem, kill pressure on natural resources and provide a predictable income to tribal families. It also raises consciousness of the problem of climate change and necessity to preserve fragile environments.

The presence of a wide array of biodiversity, forests, waterfalls, wildlife and colorful tribal culture of the state makes Odisha have a great potential in eco-tourism. Eco-tourism should be encouraged in order to decrease the loss and destruction of climate change in the tribal areas to offer alternative sources of livelihood, to increase community resiliency, and to encourage long-term environmental protection. This plan combines climate justice and sustainability with economic development. These are the same areas that are prone to economic disparity and the impact of environmental pressure and tribal territories are not different to grapple with the two issues. Tribal people in Odisha are found in remote and endowment rich landscapes, but there is low access to education, health care, infrastructure, and consistent income opportunities to them. Their needs have been overlooked in development policies or extractive models that weaken local systems have been implemented. Climatic pressures have increased over the last few years putting additional burden on the sustenance of everyday life in these regions.

Environmental disruptions have changed the use of land, impacted water supply, and lowered the sustainability of traditional jobs. This creates confusion amongst a large number of tribal households as the seasonal jobs are not regular and natural resources more unreliable. This has led to the necessity of seeking other economic solutions not based on extensive industrialization and exploitation of natural ecosystems. Any such avenue should be communally mindful and should be long term viable and not short-term profitable. Eco-tourism offers a chance to re-conceptualize development in tribal areas in a people-oriented manner. Eco-tourism does not view forests, hills and wildlife as resources that can be exploited but as ordinary resources that can be utilized to support livelihoods in case of conservation. Small scale activities which are locally based and generate income without an ecological imbalance are the concern of the model. It also allows tribal voices in the land and development decision making processes.

The cultural diversity of the tribal groups in Odisha, the unique natural landscapes are creating a high potential of eco-tourism activities. With its modest and ethical approach, the systems of traditional knowledge, local crafts, food practices, festivals and oral histories can be transformed into instruments of economic gain. Eco-tourism

enables these cultural expressions to be conserved and appreciated, instead of being substituted by foreign forces. This contributes to building the social identity and community pride. Eco-tourism assists in decentralised development, economically. The earnings gained in the shape of guiding services, domestic transportation, and handicrafts, food services, and accommodation are kept within the community. This reduces the use of external employment and the movement to the cities. Women and youth who in most instances are not able to access formal jobs can be actively involved in the activities of eco-tourism and this will bring about a wide range of social inclusion.

The enhancement of the management of natural spaces is also an issue of eco-tourism. When the communities receive some benefits by conserving the forests and landscapes, then they have a great motivation to ensure that they handle them. This is to aid in protecting soils, water and wildlife. In the long term, these practices will be able to make the environment better and minimise the threat of degradation due to unplanned development. Climate related challenges should be solved in a manner that is economic and environmental friendly. Eco-tourism is a model in which the development is not carried out at the cost of environmental destruction. To tribal communities in Odisha, it is a viable alternative to enhance local economies, aid cultural survival and provide resilience to the environment in response to changes. With the promotion of eco-tourism the development may become about fairness, sustainability and long-term benefit of the community.

Identified Gaps

The literature on climate change loss and damage, tribal livelihoods and ecotourism in India remains fragmented with numerous research gaps that are crucial in the case of the tribal communities in Odisha. First, neither empirical nor place-based data on how loss and damage (economic, cultural, and ecological) by climate change are measured on different tribal communities in Odisha nor how such losses impact on the vulnerability of the livelihoods of tribal communities exist. Second, the literature on ecotourism as a mechanism of loss-and-damage response, rather than a conservation or livelihood diversification intervention, particularly to tribal regions affected by climate impacts, is scanty. Third, there is a knowledge gap on how to integrate the tribal knowledge systems, cultural values and customary governance frameworks with ecotourism models that ensure culturally appropriate and climate resilient development. Fourth, studies rarely assess the distributional impacts of ecotourism including beneficiaries, and costs of ecotourism in tribal societies especially among women, the youths and marginalized sub-groups. Fifth, it is also clear that there is a very big gap in evaluating the long-term sustainability and climate resilience of existing or planned ecotourism projects in Odisha, and their capacity to reduce future risks in climate, but not to create new weaknesses. Sixth, policy-based studies are still restricted in their ability to examine the compatibility of climate change loss and damage models, tribal welfare policies, and tourism policies at the state and local scales. Finally, there are no participatory and community-based approaches that anticipate tribal reactions to whether ecotourism is a valid part of sustainable economic development in the context of climate stress situations.

Key Contributions of the Chapter

The chapter contributes to the already existing body of knowledge since it positions eco-tourism as a considerable solution to loss and destruction of tribal communities in the face of climate change compared to its traditional counterpart of being viewed as a conservation or income generating project. It offers a detailed observation into the contribution of eco-tourism in the maintenance of climate change, livelihood and ecology in tribal Odisha. In comparing and contrasting Similipal and Keonjhar the chapter provides much information on the role played by nature of governance structures and how the state based and the community based models facilitate participation, equity and long term sustainability. The paper also prefigures the applicability of community ownership, indigenous knowledge systems, and cultural values in planning eco-tourism programs, which are socially inclusive and culturally sensitive. The chapter provides a holistic perspective of sustainable development in climate stress as it has integrated the three aspects of the economy, the environment, and the socio-cultural factors into a single analysis. It also identifies some of the major institutional, infrastructural and policy oriented constraints to the success of eco tourism projects and therefore offers feasible feedback on how to improve governance and practice. The chapter in general can make contributions to policy and academic

discussion based on the contextual evidence in Odisha and propose eco-tourism as community-based and sustainable alternative to climate-resilient development in tribal regions.

REVIEW OF LITERATURE

Eco-tourism literature has shown the fact that it boosts the sustainable development, particularly among the vulnerable communities such as the tribal communities in Odisha. It introduces income, preserves the natural resources and upholds the culture heritage. Moreover, these initiatives require community involvement in order to be successful. The paper discusses the impacts of ecotourism on 5 hotspots within Odisha, India using the information collected by 300 households and government officials. The findings indicate that the positive effects of ecotourism on the lives of Indigenous people have not been significantly achieved which emphasizes the need to take more educational initiatives. Also, the study suggests an increase in tourist activities to include the local culture and lifestyles with the aim of creating more opportunities and engaging the community. In general, the study offers useful information to improve ecotourism practices (Pujar & Mishra, 2024). In this paper, the author is going to examine the relationship between the forestry industry and Sustainable Development Goals (SDGs) in India. It proves the importance of forests in the food, energy and water cycle and also the importance of forests in biodiversity and livelihoods. Forest management in India revolves around afforestation, enhancement of biodiversity and management of resources. Joint Forest Management as a policy is aimed at enhancing both social and economic and environmental conditions. The short-term and long-term consequences of the pandemic on the tourism industry are discussed in the Jena, Nanda (2020) research, which reveals the following issues as low demand, safety concerns, and consumer preference. It also looks into the possibilities of recovery in relation to digital transformation, sustainable tourism practices, and policy support. Also, the forestry practices in India are in line with international climate objectives, such as SDG 15, which deals with sustainable ecosystems. The trade-offs between environmental sustainability and economic growth could be the focus of future research (Dandabathula et al., 2021). The Indian coastal ecology boasts of an area of 10.78 million hectares and sustaining 17 percent of the population in the country through food, livestock and fish. India has a fishery coast that has 19.5 percent of livestock and some of the rare breeds of cattle such as Vechur and Black Bengal goats. However, there are severe problems within the area, including low harvest, saltiness, natural disasters and global warming. The possible ways to resolve the issue are to breed climate-resilient species, enhance farm management methods, and create smart villages (BEHERA et al., 2023). The present paper explores the sustainability of livelihoods of the Kattunayakan tribe in Wayanad, Kerala and it is clear that their livelihoods are typified by low annual earnings in farming and livestock. The tribe is also experiencing a number of problems, such as wildlife issues, scarcity of land and low education. The research suggests several methods to enhance the quality of life: redistribution of harmed land, the promotion of the use of crops not favored by wildlife, training on sale of value added forest products, and cooperative sales of milk. (Ramakrishnan et al., 2024). The present research is investigating the impacts of tribal tourism on cultural conservation, sustainability and empowering communities. It stresses the significance of cultural sensitivity and community engagement and equitable partnerships in tourism initiatives. In addition, the paper talks about how tribal tourism is able to generate revenue, generate jobs and positively impact the environment. It also brings the question of culture being commodified and it losing its originality and endorsing responsible methods of tourism that aid in sustainability in the long term. (Gade et al., 2024). In this 2023 paper, the heavy rains in Himachal Pradesh led to the death of 300 individuals and demolition of 10,000 structures amounting to loss of 10,000 crore. Uncontrolled development, poor management of waste disposal and construction of bad roads have worsened the environmental degradation. In addition to this, the increased tourist activities have further strained the ecosystem and therefore the need to embrace sustainable practices which can strike a balance of development and environmental protection. The introduction of an effective tourism management strategy and waste disposal methods can improve the quality of life in the area (Nag et al., 2024). The article researches the most current ecotourism literature that was published between 2002 and 2021 and included the key gaps and challenges. Even though most of these have worked, others have been faced with some issues such as lack of proper regulation, poor governance and lack of community involvement. Future studies should be devoted to the way ecotourism can be promoted by the tour operators, non-governmental organizations (NGOs) and the government agencies. It should also address the importance of environmental education, collaborations among stakeholders, and application of environmentally friendly technologies to enable sustainable development. (Samal & Dash, 2023). The report shows that participation in

agriculture and agri-ecotourism can help the rural youth to boost food security and promote economic growth. Organic farming and agroecological tourism not only enhances nutrition, but also create jobs. To ensure that the farming communities are sustainable in the long term, policymakers should invest in education, training, and entrepreneurship programs with the youth (Rana et al., 2024). Forests are highly significant in the survival of the tribal and rural populations which they provide a source of food and livelihood particularly in the West Himalayan region. Research has shown that forest resources are highly treasured but have been destroyed by harvesting of edible and medicinal products without any intention. The non-timber products also face an obstacle of poor marketing and inadequate value addition that hampers the revenues of the products. Engagement of self-help organisations, and local cooperatives may grow forest management and livelihoods. Empowering women organisations to process forest products may improve income, food security as well as sustainable forest use. (Ahluwalia, A. S. et al., 2025). Khangchendzonga National Park prohibition of grazing in Sikkim, India has ended traditional pastoralism, substituted native cattle with pack animals and limited pastoralists to enjoy the benefits of the park. This has consequently led to changes in the environment and increased human-wildlife conflict. The future policies should engage the pastoralists in conservation planning to protect the culture as well as the local species of animals (Singh et al., 2021). The study looks at the application of alternative tourism, ecotourism management and village practices that serve to improve the livelihoods of people. But it has limited sample size and qualitative design, which limits the generalizability of the results. Further research should involve larger sample size, quantitative surveys and improved procedures to improve the accuracy of the analysis. Moreover, incorporating ecotourism into farming systems has the potential to empower livelihoods and be capable of adapting to the climate change (Ramaano, 2024). The article discusses a socioeconomic philosophy known as sustainability which seeks to improve the quality of life, create a just society, and encourage peace, justice and well being. It promotes 6S principles of the global sustainability, which are education, sustainable living, equality, and clean energy. The paper highlights the necessity to make a concerted effort to build a balanced and sustainable world (Hariram et al., 2023). The Sundarbans is a mangrove reserve in India and Bangladesh, which is a UNESCO world heritage; the Sundarbans is a region with a diverse ethnic composition and a rich wildlife. Although 89 percent of the people in the region are involved in agriculture, a number of obstacles such as poor infrastructure and political corruption influence development. The study will address these problems and offer solutions to curb natural disasters using a geomorphological approach (Mondal, 2024). This research on climate change has impacted tribes immensely whose means of living rely on nature. Studies have shown them to be susceptible to poverty, low levels of education, bad governance and social marginalization. In most research, case studies and field surveys are the most prevalent methods used to assess the effects of climate in various regions but hardly ever does it take into consideration the Indigenous knowledge. The results have shown that climate change has decreased crop production, forest resource destruction, and augmented food and water insecurity. The traditional knowledge, community based practices and ecosystem based approaches used by the tribal communities help to build resilience. The lack of proper data availability, ineffective policies and institutional obstacles however, impede effective adaptation. In total, the literature underlines the need to combine Indigenous knowledge and science and adopt inclusive policies to increase climate resiliency and ensure sustainable livelihoods of tribal people. (Kumar, A. et al., 2025).

Study Area

The research is restricted along tribal regions of Odisha, India and more precisely, to two eco-tourism attractions, the Similipal Biosphere Reserve, Mayurbhanj district and some community-based eco-tourism projects, Keonjhar district. These areas were chosen because they are rich in terms of biodiversity, the tribe population is high and because the areas are increasingly vulnerable to the negative impacts of climate change on their livelihoods. Similipal is the model of a state-based, conservation-driven eco-tourism in a forest ecosystem and Keonjhar is the model of a grassroots, community-based eco-tourism model based on homestays and eco-lodges and cultural tourism. It will explore the functioning of eco-tourism in these opposite systems of governance and evaluate its effectiveness in dealing with climate change loss and damage, biodiversity conservation, community involvement, cultural heritage and livelihood sustainability among tribal communities. Based on secondary sources and qualitative thematic analysis, it is analytical, exploratory but not empirical in its scope because it aims to generate context-specific information, which is relevant in policy, planning, and sustainable development in tribal regions of Odisha.

Research objectives

1. To assess the promise of eco-tourism in curbing negative effects of climate change on tribal people in Odisha.
2. To analyze the involvement of the local tribal communities in the planning, management and success of the eco-tourism projects in Odisha.
3. To assess the effectiveness of eco-tourism in preserving biodiversity, and conservation of the natural resources of tribal areas in Odisha.
4. To study the economic benefits that eco-tourism has to the tribal community and to identify methods of enhancing the economic sustainability in the long run.

Research Questions

1. What is the role of eco-tourism in alleviating climate change impact on tribal people in Odisha?
2. What is the role of community engagement in the success of ecotourism projects in the development of tribal areas of Odisha in the long-term?
3. How can eco-tourism be employed to protect natural resources and cultural heritage of tribal people in Odisha?
4. What are the financial benefits of ecotourism to the tribal people in Odisha and how are the benefits to be enhanced to enable a long-term sustainable development?

METHODOLOGY

The study delves into the ways through which eco-tourism can mitigate the negative impacts of climate change on the tribal people of Odisha. Qualitative case study was used. Data were collected from government reports, NGO publications, academic studies, and project documents. Using thematic analysis, five dimensions were analyzed: (i) climate change mitigation, (ii) community participation, (iii) biodiversity conservation, (iv) cultural preservation, and (v) economic benefits.

Two prominent case studies are chosen for this research:

- Case Study 1: Eco-Tourism Development in Similipal, Mayurbhanj
- Case Study 2: Community-Based Eco-Tourism in Keonjhar

This study relied on secondary data sources in order to collect data. Data was collected based on Government Reports and Policy Documents to comprehend the framework and policies that guide eco-tourism in Odisha such as the regulations and strategies concerning environmental conservation strategies and the involvement of tribal communities in eco-tourism projects. Non-Governmental Organizations (NGOs) often report the consequences of community-based eco-tourism projects, environmental conservation and empowerment of the tribes. These reports will give an overview of the success of these initiatives and the challenges. Literature on eco-tourism, tribal communities and climate change will be compiled using Academic Journals and Books to develop a theoretical framework of the study. This will also give background to the greater picture of the potential of ecotourism in alleviating the effects of climate change. Annual Reports of Eco-Tourism Projects contains reports by government and non-governmental organizations reporting on the progress, success and failures of eco-tourism projects, particularly those in tribal areas.

Thematic Analysis of Eco-Tourism in Tribal Odisha

A qualitative method is known as thematic analysis, which is used to recognize, analyze and interpret patterns

or themes in data. The paper has employed thematic analysis on the information gathered in reviews of documents, secondary reports and case studies on eco-tourism projects in Similipal (Mayurbhanj) and Keonjhar.

One of the largest biosphere reserves in India and also a UNESCO-protected site is Similipal which is found in the Mayurbhanj district of Odisha. Similipal is also characterized by having large sal forests, high animal and plant biodiversity-tigers, elephants and rare orchids, and it is a great constituent of the ecology. It also harbors a certain quantity of tribal population which depends on forest resources as a source of livelihood. With the biodiversity conservation and the local livelihoods the eco-tourism projects in this region are focused with wildlife safaris, nature camps and trekking in the forests. Similipal is a major biodiversity hot spot, and has been the centre of eco-tourism development in Odisha. It will be discussed how such eco-tourism projects as nature camps and wildlife safaris have helped in safeguarding biodiversity and provide economic opportunities to the locals. The involvement of the local tribal groups in the operation of the eco-tourism projects and the input of the activities to climate change adaptation and environmental education are discussed.

Keonjhar is a beautiful location in the north of Odisha, and is known because of the mineral wealth, natural beauty and tribal culture. As compared to the state-led conservation initiative of Similipal, eco-tourism in Keonjhar has emerged in a different manner because it is defined by the community-based tourism such as homestays, eco-lodges and cultural tourism. With such enterprises, tribal families can get direct access to tourists, showcase the traditional modes of livelihood, and generate revenues and create environmental awareness. Keonjhar can thus be seen as a model of grassroots eco-tourism where the community ownership and cultural preservation is at the forefront. Homestays and eco-lodges have been the target of the community-based eco-tourism in Keonjhar. It will also focus on how local tribal communities manage such ventures, and how such projects have assisted in preserving cultural heritage, making money and improving environmental conservation. The effectiveness of such projects in terms of guaranteeing the economic sustainability in the long-term and their impact on the conservation of biodiversity will be analysed.

Along with the place-specific observations, the thematic analysis achieves the focus of the bigger structural and social dimensions of the eco-tourism in tribal regions of Odisha. The role of institutional support and policy structures is one of the significant themes that develop. The eco-tourism projects are influenced by the government departments, forest authority and tourism agencies in planning, regulation and expansion of eco-tourism projects. The extent of coordination or lack of coordination affects the success of the eco-tourism initiatives in the long run. The outcomes will be more inclusive and sustainable in the places where the policies will encourage local participation and the possibility to share the benefits. Another important theme is the capacity building of the tribal communities. Hospitality, communication, financial management and environmental monitoring skills are involved in eco-tourism. As discussed, capacity-building exercises and knowledge sharing programs are essential in enabling the tribal communities to run eco-tourism projects. Through appropriate training, communities are better prepared to handle the tourists and maintain good services and maintain local ecologies. The development of skills also enhances confidence and less dependence on external actors. Issues of infrastructure and accessibility are also cited in the study. This is typically impeded by the inadequate road networks, low digital connectivity and low basic facilities which make it hard to develop the eco-tourism in the remote tribal areas. These restrictions have impacts on inflow of tourists and decrease income potential. In the meantime the environment is also threatened by the uncontrolled development of infrastructure. This thematic analysis, therefore, indicates that there is a need to have a balanced infrastructure planning that will not frustrate the ecological sensibility and yet improves access.

Another theme that comes out is environmental responsibility. Eco-tourism initiatives are closely related to the conservation of forest, water bodies and wild animals habitat. This discussion shows that tourism activities have the potential to protect the habitat as well as to control wastes provided that the tourism activities are aligned to the conservation goals. Nevertheless, poor surveillance and poor implementation of environmental regulations may cause strain on resources. Visitors restrictions, waste management and environmentally friendly construction are thus part of sustainable actions that are required to preserve ecological integrity.

Social equity is another theme that is recurred in the analysis. Although eco-tourism provides revenue, there is no even distribution of benefits within communities. Differences based on gender, age, and social roles influence participation and access to opportunities. Women in some of these areas are also not getting involved in the eco-tourism activities due to traditionalism and workload. These inequalities in development can be overcome through the provision of support and inclusive planning to ensure equitable development.

The contribution of eco-tourism to the formation of perceptions and awareness is also pointed out in the analysis. The interaction between the tribes and the tourists paves the way to cross-cultural possibilities and education. The visitors get to know more about the native ways of life and environmental values of the locals and the local communities get sensitized about environmental issues in the world. This learning collaboration will be able to enhance respect towards cultural diversity and environmental stewardship. Overall, the thematic analysis suggests that the eco-tourism in tribal Odisha is a multi-layered and complex process. It has been successful not only depending on the natural attractions, but also the governance structures, ability of the communities, social inclusion and environmental responsibility. The understanding of these themes may be applied in development of eco-tourism patterns that would contribute to the sustainable development without violating tribal sovereignty and ecological borders.

Climate Change Mitigation (Theme-Eco-tourism as a tool for climate adaptation)

Some of the projects that reduce the pressure on forests by giving non-agricultural livelihoods include wildlife safaris and nature camps in Similipal. Keonjhar homestays and eco-lodges lead to sustainable land use and forest conservation through a combination of conservation and income. The two cases reveal that eco-tourism is diversifying livelihoods, minimal deforestation is being realized and ecological balance is being met. Besides the diversification of the livelihoods, eco-tourism fosters climate adaptability since it fosters long term environmental planning. Community involvement in tourism activities also provides awareness of the risks of climate and the awareness of the need to use resources in a sustainable manner. Since local citizens feel that they are directly benefiting through conservation, there is a high possibility that they will come up with practices that will conserve forests, soil and water sources. Low-carbon development models are also advanced through eco-tourism activities. Small tourism facilities like ecotourism friendly cottages and traditional houses are based on less energy-consuming construction. This is due to the fact that local materials and traditional methods of construction are employed which helps in reducing carbon emissions and helps in climate resilience. These strategies are in line with the larger climate mitigation objectives but save local architectural experience. The other one is the role of eco-tourism in the improvement of the ecosystem services. Conservation based tourism assists in healthy forests to offer sequestration of carbon, temperatures management and water cycles improvement. Such ecological mechanisms can be helpful in helping communities to survive climate related stressors such as heat waves and erratic rainfalls. Another aspect through which eco-tourism aids in knowledge exchange is on climate adaptation. The introduction to the new ideas of climate resilience into the local communities is provided through the contact with the researchers, conservationists and other eco-friendly visitors. Concurrently, sustainable tourism is informed by indigenous ecological knowledge. This interaction develops adaptive strategies that incorporate science and traditional knowledge that enhance general adaptability of communities to climate change.

Community Participation and Ownership (Theme- Local engagement as the foundation of success)

In Similipal, the communities are seen as mentors, hospitality employees, and artisans but they still are reliant on the government structures. Higher sense of ownership tribes directly operate homestays, cultural programs and eco-lodges in Keonjhar. Similipal is facilitative in terms of involvement and Keonjhar is the embodiment of bottom- up government. The community-controlled projects appear to be more sustainable and fairer. The involvement of communities also affects the decision-making authority and accountability in the long term. With an active participation of the tribal communities in planning and management of eco-tourism activities, a greater level of responsibility is generated towards the economic and environmental safety. The shared reaction to such a job, lessens the stress on the utilization of resources and promotes shared activity.

The social cohesion in villages is enhanced by local ownership. The eco-tourism activities usually encompass organization of the households, which comprise visitor services, common spaces and cultural events. Such social interactions result in the creation of trust, cooperation and mutual support among the members of the community. Consequently, eco-tourism will help in the empowerment of local institutions and leadership. Another important aspect of participation is knowledge preservation. Community-led tourism allows the tribal communities to become speakers of their culture, stories and skills. This will minimize the chances of misrepresentation of culture and make cultural expressions significant to the community. Through active engagement, the younger generations are also able to learn and appreciate their heritage. Financial transparency is also influenced by the degree of ownership. The communities are likely to adopt fair systems of revenue sharing as long as they are in control of the revenue. This will improve equity in the economy and reduce reliance on external agencies. Community-controlled models will be in a position to build self-reliant systems with time adjusting to the different economic and environmental conditions without compromising local priorities.

Biodiversity Conservation (Theme- Eco-tourism as a conservation strategy)

Similipal helps preserve a variety of flora and fauna by limiting human activities in the sensitive regions, and this is achieved with the assistance of monitoring by state. Keonjhar is oriented on the environmentally friendly operations (waste management, eco-friendly accommodation) and raises the awareness of the local ecology. Similipal has institutionalized conservation and policy directed conservation when compared to Keonjhar which embraces conservation in daily community-tourist relations.

In addition to protection efforts, the value of biodiversity by various stakeholders is also affected by eco-tourism. Conservation is not perceived as a rule that should be adhered to in the community but as a collective responsibility. The daily host-visitor interactions provide an opportunity to expound the importance of the local plants, animals and landscapes and help to build up the respect to nature not through impositions but through experience. Eco-tourism is also conducive to conservation by coming up with economic alternatives to biodiversity destroying activities. Since income is generated through tourism, communities are not dependent on activities such as over-timber harvesting, hunting or land use. This economic transformation lessens the stress on ecosystems and enables natural habitats to rejuvenate with time. Education and awareness is another ingredient of conservation. Guided tours, local narration and interpretation activities help the visitor to understand ecological relationships and seasonal patterns. These types of educational programs encourage responsible tourism and make the environment more open-minded towards the environment outside the local context. Adaptive conservation strategies are also important as revealed by the thematic analysis. There are various ecological zones that should be managed differently. The adaptive eco-tourism designs allow the conservation activities to be diversified based on the environmental response, visitor effects and neighborhood interests. This flexibility enhances the resilience of ecosystems as well as long-term biodiversity conservation whilst ensuring a balance between humanity and nature.

Economic Benefits and Sustainability (Theme-tourism as a livelihood enhancer)

Similipal creates jobs in guiding, hospitality and sales of handcrafts yet has limited training and poor infrastructure. Homestays, food and cultural events introduce stability in the household income of the people of Keonjhar, which is assisted by NGOs and CSR in capacity building. The two locations have economic potentials, yet sustainability in the long run will rely on better infrastructure developments, marketing, and skills.

Income stability and risk management is another parameter in economic sustainability in eco-tourism. Tourism habits seasonally may cause unequal income, particularly during monsoon seasons or severe weather conditions. Tourism related activities like the sale of local products and educational programs should be diversified to lower the fluctuations in the income and make their contribution to the financial security of households more reliable. Another key factor is financial literacy. Most of the tribal entrepreneurs are not experienced in budgeting, pricing, and long-term financial planning. Basic financial management training can empower communities to reinvest tourism earnings in maintenance, education and savings to enhance economic sustainability in the long term.

Sustainability is also affected by market access and visibility. Poor digital connectivity and inadequate promotion limit the access of eco-tourism destinations. The online platforms, the local tourism networks and cooperation with travel agencies can be strategically used to promote visitor numbers without causing ecological overloads. Enhanced marketing will help to balance the advantages throughout the year.

Lastly, tourism revenue should be reinvested in the community welfare, which increases sustainability. The money spent on education, health care and environmental maintenance enhances the general quality of life and minimizes susceptibility. When the revenue of the eco-tourism is used to enhance common community interests, it is not merely a source of livelihood but it also leads to long-term development based on the local interests.

Challenges and Constraints (Theme- Structural and institutional limitations) Similipal is extremely dependent on government subsidies; training and infrastructure is restrictive to development. In Keonjhar, localized but not visible and has no wider markets; requires additional institutional and marketing support. Although eco-tourism is providing opportunities, the success of the eco-tourism is the external structural barriers which need to be overcome by investing and supporting the policy.

The two cases highlight the utilization of eco-tourism in the prevention of climate change, conservation of biodiversity and livelihood diversification. Similipal is however, state oriented and conservation oriented and Keonjhar is community based tourism and culture based tourism. There should be a balance between the government subsidies and ownership by the community. Both of these dimensions combined in the projects will be more effective in terms of long-term results.

Along with institutional gaps, socio-economic constraints limit the process of the development of eco-tourism projects. The fact that the literacy levels are low and that the communities are exposed to the formal tourism systems reduce the ability of the communities to interact with the external stakeholders. This could lead to the dependence on the middlemen that is likely to diminish household earnings and social dominance.

There are also administrative complexities that pose a problem. Prolonged approval procedures, vague land-use policies, and duplication of jurisdiction among departments slow down the implementation of the project. These procedural hurdles deter innovation and hamper the growth of activities in eco-tourism especially in remote tribal areas.

Another significant constraint is access to finance. A number of eco-tourism projects require initial investment on simple facilities, safety and marketing. Tribal communities are in most cases deprived of credit, insurance and financial institutions. Without particular financial support, it would be difficult to scale up successful models. The need to plan in the long-term is also highlighted in the analysis. Unsustainable projects that are short-term may generate a dependency instead of resilience. Monitors should be in place, feedback and the system of adaptive management to address the changes in the environment and economy.

To overcome these issues, there is a need to consider the policy approaches that are integrated to relate tourism, forest management, rural development, and climate planning. Institutional coordination and provision of tailor-made services will be helpful in helping the eco-tourism achieve a stable and sustainable development pattern to Odishi tribal communities.

Table 1: Thematic analysis summary

Theme	Sub-Theme / Focus	Similipal	Keonjhar	Insights / Comparison
Climate Change Mitigation	Eco-tourism as a tool for climate adaptation	Wildlife safaris and nature camps reduce pressure on forests by providing non-agricultural livelihoods	Homestays and eco-lodges promote sustainable land use and link conservation with income	Both sites show that eco-tourism diversifies livelihoods, reduces deforestation, and supports ecological balance

Community Participation and Ownership	Local engagement as foundation of success	Communities work as guides, hospitality staff, and artisans but rely on government frameworks	Tribes directly manage homestays, cultural programs, and eco-lodges, reflecting bottom-up governance	Participation in Similipal is more supportive; Keonjhar shows greater community control, sustainability, and equity
Biodiversity Conservation	Eco-tourism as a conservation strategy	Rich flora and fauna protected through restricted human intervention and state monitoring	Sustainable practices (waste management, eco-lodges) and awareness programs embedded in community-tourist interactions	Similipal's conservation is formalized and regulation-driven; Keonjhar integrates conservation into daily practices
Economic Benefits and Sustainability	Tourism as a livelihood enhancer	Employment in guiding, hospitality, handicrafts; limited by training and infrastructure	Stable household income from homestays, food, cultural events; NGOs/CSR support capacity building	Both show economic promise; long-term sustainability depends on infrastructure, skills, and marketing
Challenges and Constraints	Structural and institutional limitations	Heavy dependence on government; training and infrastructure gaps	Community-driven but lacks visibility and wider market access; needs institutional and promotional support	Eco-tourism opportunities exist, but success is limited by structural and institutional barriers requiring policy and investment support
Overall Comparison	Governance and sustainability balance	More state-driven, conservation-focused	Community-led, culturally rooted	Projects combining government support and community ownership likely yield stronger long-term outcomes

The thematic analysis indicates that eco-tourism in Odisha is a multidimensional approach: it reduces climate change, biodiversity, community empowering, and livelihoods. But the difference between Similipal and Keonjhar indicates that community ownership and good institutional support should be hand-in-hand. In achieving long-term sustainability of eco-tourism, the policies need to invest in infrastructure, capacity-building and marketing but equal benefits should be distributed to the tribal communities. Long-term monitoring and evaluation systems should also be taken into account in the future eco-tourism initiatives. Regular assessment of the environmental impact, community satisfaction and economic outcomes can contribute to the definition of gaps and inform improvements. The inclusion of feedback of the tribal communities in the planning processes will enhance trust and relevance. The collaboration with academic institutions and civil society organizations can also contribute to promoting knowledge exchange and innovation. The alignment of eco-tourism mission to the local wants and local development goals can make eco-tourism a strong notion that ensures inclusive development without cutting ecological and cultural boundaries.

CONCLUSION

Eco-tourism has the potential of transformation in terms of the twin issues of climate change and socioeconomic vulnerability of the tribal communities of Odisha. The eco-tourism projects are able to successfully mitigate environmental degradation, enhancement of biodiversity conservation, as well as providing alternative

livelihoods similar to the case studies of Similipal and Keonjhar. Top-down, state-based model of Similipal and bottom-up, community-based model of Keonjhar encourage higher degree of local participation and cultural preservation, respectively. Eco-tourism cannot solely be deemed successful based on its environmental and economic outcomes but also on the extent to which community is involved and institutionalized. Projects that are facilitated by the government and whose ownership is on the grassroots are more sustainable and inclusive. It is however, true that both regions are weak in structure, such as low training, infrastructural weakness and lack of visibility, which should be alleviated through specific investment, improvement of governance structures and policy change. Lastly, eco-tourism, cannot be looked at as a separate intervention, but as the aspect of a holistic sustainable development policy- where environmental conservation, cultural integrity and economic sustainability are intertwined. Other regions can learn much to be climate-resilient and community-based in pursuit of climate-resilient solutions by the experience of Odisha.

The Odisha eco-tourism projects can be scaled up in future as it is possible to have networks between tribal areas. It is possible to share and disseminate best practices, lessons, and local innovations without traps of ecological and societal pitfalls to replicate the successful practices in other districts. Enhancing collaborations between state institutions, non-governmental bodies, and players of the private sector can also offer technical, financial, and marketing assistance to allow communities to deal with bigger or diversified tourist products.

Education and awareness programs are very reliant on these programs. Eco-tourism has a capacity to bring the culture of conservation and proper utilization of the environment by informing the communities of the tribe and the visitors on the conservation, cultural sensitivity and adaptation to the weather. The particular focus on the involvement of youth and women guarantees continuity between generations and helps to guarantee social inclusion.

Finally, eco-tourism must also be included in the regional development plans such that it is aligned with the other climate adaptation and livelihood plans. It is connected to eco-tourism and sustainable agricultural practices, renewable energy and forest management programs and it improves the ability to withstand climate changes and better economic prospects. A well-planned odisha eco-tourism experience can be exemplified to incorporate ecological conservation, cultural preservation and economic empowerment to other vulnerable regions in India and other parts of the world.

FINDINGS

1. **Climate Change Mitigation through Eco-Tourism-** Eco-tourism in both Similipal and Keonjhar helps mitigate the impacts of climate change by promoting sustainable land management practices, reducing deforestation, and supporting conservation initiatives. These practices contribute to the protection of forests and wildlife, which are critical for maintaining the ecological balance and mitigating climate change.
2. **Community Participation in Eco-Tourism Management-** In both case studies, tribal communities are actively involved in the planning, management, and execution of eco-tourism projects. In Similipal, local communities are engaged in nature tourism activities, such as guiding tourists on wildlife safaris, while in Keonjhar, tribal families run homestays and eco-lodges. Their involvement is crucial to the success of these initiatives, ensuring that eco-tourism benefits are equitably distributed.
3. **Biodiversity Conservation-** Eco-tourism initiatives in Similipal and Keonjhar have shown effectiveness in conserving biodiversity. In Similipal, eco-tourism helps protect the park's rich flora and fauna, with initiatives that limit human intervention in sensitive areas. In Keonjhar, eco-tourism encourages sustainable practices that reduce environmental degradation and increase awareness about the importance of preserving local ecosystems.
4. **Economic Benefits and Long-Term Sustainability-** Eco-tourism in both regions has provided significant economic benefits to tribal communities. In Similipal, employment opportunities have been created in

guiding, hospitality, and other tourism-related activities. In Keonjhar, income generated from homestays and eco-lodges has enhanced the economic stability of tribal families. The study identifies the need for continuous investment in capacity-building and infrastructure to ensure the long-term economic sustainability of these initiatives.

Limitations

This study is subject to certain limitations that should be acknowledged. First, the analysis relies entirely on secondary data sources such as government reports, NGO publications, and existing academic literature, which may vary in accuracy, scope, and timeliness, potentially affecting the depth of empirical insights. Second, the qualitative case study approach focused only on two regions, Similipal and Keonjhar, which limits the generalizability of the findings to other tribal regions of Odisha with different ecological, social, and institutional contexts. Third, the absence of primary field-level data restricts direct engagement with tribal community perspectives, thereby limiting the ability to capture lived experiences, intra-community variations, and localised challenges in greater detail. Fourth, the study does not quantitatively measure economic gains, biodiversity outcomes, or climate adaptation impacts, which constrains the ability to assess the scale and magnitude of eco-tourism benefits. Finally, institutional and policy dynamics are examined broadly, but the lack of longitudinal data limits the assessment of long-term sustainability and resilience of eco-tourism initiatives under evolving climate change conditions.

Future directions

Future research and policy efforts should focus on strengthening eco-tourism as a climate-resilient and community-centred development pathway for tribal regions in Odisha. There is a need for primary, participatory, and longitudinal studies that capture tribal perceptions of climate change-induced loss and damage and systematically assess the long-term economic, ecological, and cultural impacts of eco-tourism initiatives. Integrating indigenous knowledge systems with scientific climate adaptation frameworks can enhance the relevance and resilience of eco-tourism models. Greater attention should be given to inclusive governance by ensuring the meaningful participation of women, youth, and marginal tribal sub-groups in decision-making and benefit-sharing processes. From a policy perspective, stronger institutional coordination among tourism, forest, tribal welfare, and climate agencies is essential, along with targeted investments in infrastructure, digital connectivity, skill development, and market access. Future initiatives should also establish monitoring and evaluation mechanisms to track environmental impacts, livelihood outcomes, and social equity over time. By aligning eco-tourism with broader climate adaptation, sustainable livelihoods, and regional development strategies, Odisha can develop scalable and replicable models that address climate change loss and damage while safeguarding ecological integrity and tribal cultural heritage.

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