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Environmental Pollution and Threats to the Future of Sustainable Ecotourism: Challenges and Solutions in Riau Province

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ABSTRACT

Riau Province has great potential in ecotourism development, especially in coastal areas, mangrove forests, and tropical peatlands. However, this development is faced with serious challenges in the form of environmental pollution that threatens the sustainability of natural tourism destinations. This study aims to identify the forms of pollution that occur in Riau's ecotourism areas, analyze their impacts on ecosystems and tourism activities, and formulate strategic solutions for sustainable management. The method used is a qualitative approach with case studies in several leading ecotourism locations such as Mangrove Ecotourism in Bengkalis and Zamrud Lake tourism in Siak. Data were collected through interviews, observations, and field documentation. The findings of this study clearly demonstrate that environmental pollution—particularly from domestic waste, peatland fires, and land-use changes—poses a significant threat to the ecological integrity and long-term viability of ecotourism destinations in Riau Province. Without immediate and coordinated intervention, these threats risk undermining the region's ecotourism potential. Therefore, this study concludes that sustainable ecotourism in Riau can only be achieved through an integrative and participatory management model that involves capacity building for local communities, strict enforcement of environmental regulations, and multi-stakeholder collaboration. Such strategic efforts are essential to preserve the natural assets of Riau and ensure that ecotourism continues to provide ecological, social, and economic benefits in the future.

1. INTRODUCTION

Ecotourism has developed into a promising tourism approach, not only as a driver of the local economy but also as an instrument for environmental conservation. As a form of alternative tourism, ecotourism emphasizes the importance of a harmonious relationship between humans and nature through responsible, educational, and sustainable tourism activities (Fennell, 2020). In Indonesia, this concept is increasingly popular along with the increasing awareness of the importance of environmentally friendly development, including in Riau Province which has great potential in developing ecotourism based on mangrove ecosystems, peat forests, natural lakes, and coastal areas.

Riau Province is known for its unique ecosystem wealth, such as the Mangrove Forest area in Bengkalis, Zamrud Lake in Siak, and the Giam Siak Kecil–Bukit Batu Biosphere Reserve designated by UNESCO. The biodiversity in this area is not only an ecological asset but also has high economic value if managed through an ecotourism approach (BKSDA Riau, 2021). However, various reports indicate that the sustainability of the ecosystem in this region is facing serious pressure due to environmental pollution which is increasing every year.

Data shows that forest cover in Riau has decreased drastically from 78% in 1992 to only 22% in 2019, with a

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deforestation rate of around 160,000 hectares per year. In 2015, forest fires in Riau burned around 500,000 hectares of land, causing economic losses of Rp120 trillion. In 2024, similar fires caused losses of around Rp50 trillion. In 2019, there were 221 hotspots in Riau, with most of them located on peatlands, indicating a high risk of fire and ecosystem degradation. The data above shows that although Riau Province has extraordinary ecosystem wealth and great potential for ecotourism development, significant environmental pressures such as deforestation, forest fires, and water pollution threaten the sustainability of these ecosystems.

Environmental pollution is a major threat to the future of ecotourism in Riau. Large-scale industrial, mining, and plantation activities have caused land degradation, water pollution, and damage to mangrove and wildlife habitats (Walhi Riau, 2020). In addition, tourism practices that have not fully implemented the principles of sustainability have also worsened this condition, for example through increased solid and liquid waste from tourist activities and the lack of an adequate waste management system in tourist areas (Sari et al., 2022).

The impact of this pollution is not only ecological, but also social and economic. When environmental quality declines, tourism appeal also weakens. Polluted water, loss of endemic flora and fauna, and disruption of landscape aesthetics lead to a decrease in the number of tourist visits (Putri & Kurniawan, 2021). For local communities who depend on ecotourism for their livelihoods, this condition means the loss of sources of income, increased economic vulnerability, and the potential for social conflict due to increasingly limited access to natural resources.

This problem is exacerbated by weak regulation and coordination between stakeholders. There are still many ecotourism areas that are managed without comprehensive environmental planning, and without the active involvement of local communities in monitoring and protecting the area (Hidayat & Prasetyo, 2019). On the other hand, environmental awareness among tourists is also still low. Studies show that the behavior of littering, damaging vegetation, and exploiting animals for entertainment still often occurs in the field (Rahmawati et al., 2021).

Given the complexity of this issue, collaborative and integrated efforts are needed in managing ecotourism in Riau (Sadad, et.al, 2024). A participatory approach involving the government, industry players, local communities, and tourists is essential to create a sustainable and adaptive governance model to environmental challenges (Sadad, et.al, 2022). This paper aims to examine the relationship between environmental pollution and threats to the sustainability of ecotourism in Riau Province, with a focus on identifying forms of pollution, their impacts on ecosystems and the local economy, and management solutions that can be adopted collaboratively. By understanding more deeply the existing conditions and challenges, it is hoped that an ecotourism development strategy can be formulated that not only maintains the beauty of nature, but also strengthens the social and economic resilience of the surrounding community.

This paper critically examines how environmental pollution threatens the sustainability of ecotourism in Riau Province, with a focus on its ecological, economic, and social implications.

2. METHODS

This study uses a descriptive qualitative approach. This approach was chosen because it is able to capture in depth the complex social and ecological realities, and provides space for various perspectives that emerge from local actors who are directly involved in the management and utilization of ecotourism areas. The study was conducted in three areas that have strong natural ecotourism characteristics while also facing environmental pressures, namely the Bengkalis Mangrove Forest, Zamrud Lake in Siak Regency, and the Giam Siak Kecil–Bukit Batu Biosphere Reserve area. These three locations were chosen based on considerations of their ecological potential, their strategic role in the development of nature-based tourism in Riau, and the fact that all three have experienced real impacts from environmental pollution activities.

Data collection was carried out through a combination of field observations, in-depth interviews, and documentation studies. Observations were carried out directly in the field by paying attention to the physical conditions of the environment such as the presence of garbage, vegetation damage, changes in water quality, and the intensity of tourism and industrial activities around the location. This is important to obtain a real picture of the forms of pollution that occur and the extent of their impact on the carrying capacity of the area.

Interviews are one of the main sources of data in this study. The informants consisted of ecotourism managers, community leaders, local government representatives,

environmental activists, and tourists. Through interviews, researchers explored the views of informants regarding the main causes of pollution, their perceptions of current environmental conditions, and the challenges faced in maintaining the sustainability of tourist areas. In addition, interviews also provided valuable information regarding various local initiatives and solutions that have been implemented or planned.

To strengthen the field findings, researchers also utilized documentation studies of various written sources such as local government annual reports, tourism management plan documents, environmental organization reports such as Walhi, as well as relevant scientific articles and local media news. Information from these documents was used to compare field data with applicable policies and to see the consistency between plans and implementation.

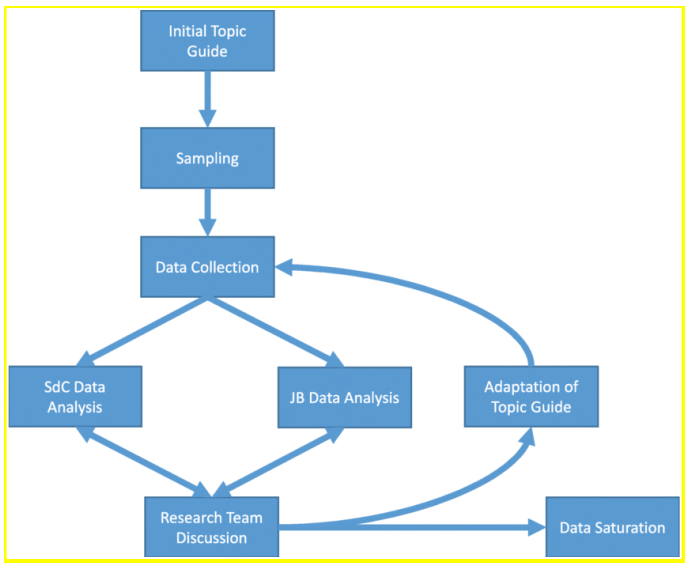

Figure 1. Research flow diagram

Data obtained from various sources were then analyzed using a thematic approach. This process began by rereading all interview notes and transcripts, identifying emerging patterns, and organizing them into main themes that represent key issues in this study, such as forms of pollution, impacts on tourism and communities, and existing management models. To maintain the validity of the data, triangulation was carried out between the results of observations, interviews, and documents, as well as clarification of the results with several informants through the member check process. With this approach, the study is expected to be able to provide a complete picture of the condition of environmental pollution in the Riau ecotourism area and its impact on the sustainability of nature tourism in the future. In addition, this method allows researchers to capture local nuances and socio-ecological complexities that are often not visible in statistical data or formal reports alone.

3. RESULT AND DISCUSSION

To understand the dynamics and challenges of sustainable ecotourism development in Riau Province, this study employs a descriptive qualitative approach. This approach was chosen because it is able to capture in depth the complex social and ecological realities, and provides space for various perspectives that emerge from local actors who are directly involved in the management and utilization of ecotourism areas. The study was conducted in three areas that have strong natural ecotourism characteristics while also facing environmental pressures, namely the Bengkalis Mangrove Forest, Zamrud Lake in Siak Regency, and the Giam Siak Kecil–Bukit Batu Biosphere Reserve area. These three locations were chosen based on considerations of their ecological potential, their strategic role in the development of nature-based tourism in Riau, and the fact that all three have experienced real impacts from environmental pollution activities.

3.1 Environmental Pollution Occurring in Main Ecotourism Areas

Based on the results of research conducted in three main ecotourism areas in Riau Province—Bengkalis Mangrove Forest, Zamrud Lake in Siak Regency, and the Giam Siak Kecil–Bukit Batu Biosphere Reserve area—it was found that environmental pollution has become a serious threat to the sustainability of the ecosystem and the attractiveness of the area as a natural tourism destination. These three locations show different forms and impacts of pollution, but all show the same tendency: environmental degradation causes a decline in the quality of the tourist experience and has a broad socio-ecological impact on the surrounding community.

In Bengkalis Mangrove Forest, the most visible environmental pollution is the accumulation of plastic waste carried by ocean currents or thrown directly by visitors and the surrounding community. This waste is trapped in the mangrove roots, creating an unpleasant and potentially dangerous sight. Tourists' perceptions of this area have also begun to change. Based on interviews with several visitors, it was found that the image of the ecotourism area has begun to shift from a natural and clean area to an area that

is poorly maintained. This strengthens Weaver's opinion (2001) that environmental quality is one of the main indicators in maintaining tourist interest in nature-based destinations.

Most of the informants stated that they were disappointed with the environmental conditions they encountered, especially the presence of plastic waste along the trekking trail and mangrove area. Some tourists even mentioned that these conditions reduced their interest in returning or recommending the place to others. Not only visual factors, changes in the atmosphere of the area are also a concern. Tourists feel that the experience of being at one with nature, which is usually the main attraction of ecotourism, is disturbed by the unpleasant odor of piled up organic waste and the noise from uncontrolled activities, such as the use of motorized boats in areas that should be kept quiet.

This is in line with the findings of Ballantyne and Packer (2011), which state that the low quality of tourism experience due to environmental degradation can affect tourists' long-term perceptions of the conservation value of a destination. Furthermore, the absence of information boards or educational signs along the tourist trail is also a highlight. Several visitors admitted that they did not know that the area was an important habitat for certain flora and fauna species. This shows that the lack of an interpretive approach in tourism management contributes to the low awareness and concern for environmental conservation. In fact, this approach has proven effective in shaping responsible tourist behavior (Moscardo, 1999; Ham & Weiler, 2002). Therefore, this negative perception can be an early indicator that the management of the area requires immediate improvement so as not to lose its long-term appeal as a sustainable ecotourism destination.

Figure 2. Pollution in the Bengkalis mangrove area

Meanwhile, in Zamrud Lake, pollution occurs mainly from household activities and fish ponds that use chemical feed and fertilizers. The lake water, which was previously clear, becomes cloudy and sometimes smells bad, especially during the dry season when the water volume decreases. This condition raises concerns about eutrophication and changes in the composition of aquatic ecosystems that can reduce biodiversity (Carpenter et al., 1998). In field observations, researchers also found a number of points around the lake that were used as waste disposal sites from residential areas.

The socio-economic impact of the environmental degradation in Zamrud Lake is also quite significant. The income of people who previously depended on tourism and supporting services, such as boat rentals or selling handicrafts, has decreased sharply. Several local homestays even admitted that they had to temporarily close due to reduced demand from tourists. This reflects the thesis of Gössling (2003) who stated that environmental damage due to tourism can actually create a cycle of local economic decline if not handled with a sustainable approach.

The decline in the number of tourist visits has not only had an impact on tourism business actors, but has also spread to the informal sector such as street vendors, local motorcycle taxi drivers, and MSME actors who sell typical foods or souvenirs based on local wisdom. Interview data with local business actors shows that in the past two years, their daily income has decreased by 40-60%. This condition has caused an increase in the economic dependence of the community on other sectors that have the potential to be more environmentally damaging, such as land clearing for intensive agriculture or ponds without environmental permits.

Figure 3. Fish farming activities at Zamrud Lake

In addition, the decline in tourism activities has also had an impact on the collective spirit of the community in maintaining the Zamrud Lake area. Previously, participation in routine clean-up and conservation activities was part of the community's social activities. However, these activities have now decreased because the community feels that they no longer receive direct benefits from ecotourism. This reinforces Scheyvens' (1999) view that economic empowerment and social incentives are essential in ensuring local community participation in sustainable tourism practices. Without clear incentives, commitment to conservation will weaken, and environmental conservation efforts will be difficult to maintain in the long term.

On the other hand, the Giam Siak Kecil–Bukit Batu Biosphere Reserve area faces more complex challenges. This area is not only experiencing pollution in the form of waste, but also faces serious threats from peatland fires and forest encroachment. Land fires, which occur almost every dry season, produce smoke that not only reduces air quality but also causes extensive damage to the highly vulnerable peat ecosystem. Indonesia as a whole has long faced the problem of peatland fires that have caused health and ecological crises (Page et al., 2002). In addition to causing ecological losses, fires also disrupt microclimate stability and release large amounts of carbon emissions, thereby exacerbating the impacts of global climate change (Marlier et al., 2015).

These fires also cause major losses to the tourism sector, as access to tourist locations is limited or closed, and the image of the area as a healthy and natural place is damaged. Interviews with conservation officers and indigenous communities revealed that illegal land clearing for oil palm plantations is the main cause. This activity is driven by economic needs, weak law enforcement, and the lack of sustainable livelihood alternatives for communities around the biosphere area.

The problem is that peat fire control policies are often ineffective because they do not address the root cause, namely the greater economic incentives for land conversion compared to conservation (Tacconi, 2016). Meanwhile, local communities who previously acted as forest guardians began to lose trust and involvement because they were not involved in the decision-making process and fair management of the area. This problem shows that ecotourism area conservation cannot be separated from the socio-economic dimensions of the surrounding community. Without empowerment and clear economic incentives, conservation will be difficult to maintain. Strengthening community capacity, increasing access to green economy programs, and integrating community-based approaches into biosphere area management policies are important solutions that need to be prioritized in the future (Sloan et al., 2019).

Figure 4. Peatland fires in the Biosphere Reserve

From the three locations, it is clear that environmental pollution not only has an impact on the decline in the quality of the ecosystem, but also erodes tourist attractions and disrupts the economic activities of local communities who are highly dependent on the sustainability of this sector. Several initiatives from the community have indeed begun to be seen, such as beach clean-up movements and independent replanting of mangroves, but the scale and impact are still very limited. An integrative and participatory approach is needed, involving all stakeholders ranging from the government, tourism actors, civil society organizations, to local communities. Suggested strategies include strengthening environmental regulations, consistent law enforcement against environmental violations, increasing community capacity in managing conservation-based tourism, and establishing cross-sector collaboration in the governance of natural tourism areas.

3.2 Sustainable Ecotourism: A Comprehensive Solution

Hese findings underscore the importance of sustainable and participatory natural resource management, as emphasized by Ostrom (1990), that community-based collective management can be effective if supported by a

strong local rule system and institutional support from the government. The lack of community involvement in planning and decision-making is also a major obstacle in implementing the principle of sustainability. Several policies that are implemented, such as the expansion of tourism zones or the construction of commercial facilities around the lake, are often carried out without adequate public consultation. This not only causes horizontal conflict between community groups, but also creates distrust of the government as the manager.

As explained by Pretty (2003), true participation in environmental management requires not only the physical involvement of the community, but also their empowerment in the decision-making process and control over resources. The active role of the community as direct managers will provide a more stable long-term effect on environmental sustainability and the socio-economic resilience of the area. By strengthening local institutions and creating a space for dialogue between stakeholders, ecotourism management can be redirected to a sustainable path.

These three case studies consistently show that environmental pollution in the context of ecotourism is not merely a technical problem, but is a complex phenomenon involving ecological, social, economic, and institutional aspects. Ecotourism, which should be an alternative for sustainable development, is vulnerable to degradation if it is not managed with strict sustainability principles. When ecotourism develops without adequate environmental regulations or without the active participation of local communities, the risk of pollution, habitat destruction, and social inequality will increase significantly (Honey, 2008).
Ecologically, environmental degradation in ecotourism areas often occurs due to pressure that exceeds the carrying capacity of the environment. When the number of tourists is not controlled properly, and supporting infrastructure is not built in an environmentally friendly manner, pollution, soil erosion, and loss of biodiversity are inevitable consequences (Buckley, 2009). Meanwhile, from a social and economic perspective, exclusive management by outsiders without involving local communities will lead to inequality, conflict, and a decrease in community commitment to conservation (Stronza & Gordillo, 2008).
Institutionally, weak coordination between government agencies, lack of human resources in the conservation sector, and minimal budget allocation for monitoring and law enforcement also worsen the situation. Many ecotourism policies are ideally written well in planning documents, but fail in implementation due to the absence of an effective monitoring system (Eagles, McCool, & Haynes, 2002). In other words, ecotourism that is not managed cross-sectorally and based on inclusive governance will easily shift into an exploitative form of mass tourism.

Solutions to environmental pollution in the context of ecotourism are not sufficient through technical approaches such as waste management or reforestation, but must be integrated with a strong institutional approach, empowerment of local communities, and commitment to long-term ecological values. Solutions to this problem require a multidimensional approach. Infrastructure such as trash bins, environmentally friendly toilets, and waste management systems are important, but not enough. A paradigm shift is needed in tourism management, from being exploitative to a community-based conservation approach. Local governments need to formulate spatial planning policies based on environmental carrying capacity and implement regulatory instruments that are able to balance economic growth and natural resource conservation (McCool & Moisey, 2001).

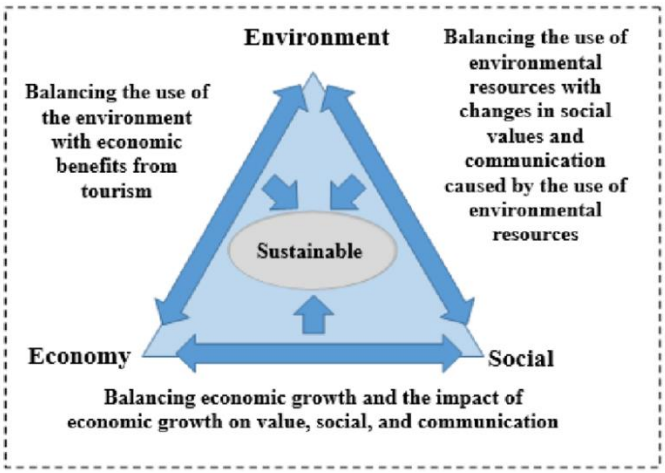

Figure 5. Sustainable Ecotourism Design Plan

In addition, environmental education for the community and tourists is very important. Based on the interview results, most environmentally unfriendly behaviors such as littering are carried out due to a lack of knowledge of their impact on the local ecosystem. Therefore, the integration of educational materials in every tourism activity, from welcoming tourists to interpretive

tours, can be a long-term strategy to form a strong ecological awareness (Ballantyne & Packer, 2011).

Strengthening local institutions is also a priority. Tourism awareness groups (Pokdarwis), traditional institutions, and environmental conservation communities must be empowered to take a more active role in monitoring and managing tourism areas. The co-management model, where management responsibilities are shared between the community, government, and the private sector, has proven successful in various studies of community-based natural resource management in tropical areas (Berkes, 2004).

Overall, the results of this study show that the future of sustainable ecotourism in Riau is largely determined by the ability to handle environmental pollution comprehensively and collaboratively. Without immediate and comprehensive intervention, areas that currently have high ecotourism value are at risk of losing their appeal and becoming an ecological burden for the region. However, if managed wisely, these areas can be a real example of the synergy between environmental conservation and improving the welfare of local communities.

4. CONCLUSION

The great potential of ecotourism in Riau Province is currently facing serious challenges in the form of environmental pollution that directly threatens the sustainability of natural tourism destinations. Based on research results in a number of leading ecotourism locations, it was found that the three most dominant forms of pollution are domestic waste, land fires, and uncontrolled land conversion. In the Bengkalis Mangrove Forest area, household waste pollution, especially plastic waste, is the main problem. This waste is carried from settlements and rivers and then accumulates around the mangrove roots. A local guide said that visitors often complain about the smell and dirty coastal conditions. In fact, some of them are reluctant to return, which of course has an impact on reducing the income of local tourism actors.

Meanwhile, Zamrud Lake in Siak Regency, which was once known for its clear water and natural charm, is now starting to be threatened by peatland fires around it. The haze that appears periodically not only harms health, but also disrupts and drastically reduces tourism activities. One of the lake tourism managers said that during the smoke season, the number of visits could drop by more than half, and this directly affects the economy of the community who depend on the natural tourism sector for their livelihoods. The situation is no less concerning in the Giam Siak Kecil–Bukit Batu Biosphere Reserve area. Although it has been recognized by UNESCO, this area still faces threats from illegal logging activities and the expansion of oil palm plantations. Environmental activists met at the location stated that the existence of rare species such as Sumatran tigers and elephants is starting to be difficult to find around the buffer zone. This is a strong signal that habitat destruction has reached an alarming level and threatens the sustainability of ecotourism attractions that rely on rich biodiversity.

From the three locations, it is clear that environmental pollution not only has an impact on the decline in the quality of the ecosystem, but also erodes tourist attractions and disrupts the economic activities of local communities who are highly dependent on the sustainability of this sector. Several initiatives from the community have indeed begun to be seen, such as beach clean-up movements and independent replanting of mangroves, but the scale and impact are still very limited. An integrative and participatory approach is needed, involving all stakeholders ranging from the government, tourism actors, civil society organizations, to local communities. Suggested strategies include strengthening environmental regulations, consistent law enforcement against environmental violations, increasing community capacity in managing conservation-based tourism, and establishing cross-sector collaboration in the governance of natural tourism areas.

REFERENCE

Ballantyne, R., & Packer, J. (2011). Using tourism free-choice learning experiences to promote environmentally sustainable behaviour: The role of post-visit 'action resources'. Environmental Education Research, 17(2), 201-215.

Berkes, F. (2004). Rethinking community-based conservation. Conservation Biology, 18(3), 621-630.

Buckley, R. (2009). Evaluating the net effects of ecotourism on the environment: A framework, first assessment and future research. Journal of Sustainable Tourism, 17(6), 643–672.

BKSDA Riau. (2021). Laporan Tahunan Konservasi Wilayah Riau. Pekanbaru: Balai KSDA Riau.

Carpenter, S. R., Caraco, N. F., Correll, D. L., Howarth, R. W., Sharpley, A. N., & Smith, V. H. (1998). Nonpoint pollution of surface waters with phosphorus and nitrogen. Ecological Applications, 8(3), 559-568.

Eagles, P. F. J., McCool, S. F., & Haynes, C. D. (2002). Sustainable tourism in protected areas: Guidelines for planning and management. IUCN.

Honey, M. (2008). Ecotourism and sustainable development: Who owns paradise? (2nd ed.). Island Press.

Fennell, D. A. (2020). Ecotourism (5th ed.). Routledge.

Gössling, S. (2003). Tourism and development in tropical islands: Political ecology perspectives. Edward Elgar Publishing.

Ham, S., & Weiler, B. (2002). Interpretation as the centerpiece of sustainable wildlife tourism. In Sustainable tourism (pp. 35–44). CRC Press.

Hidayat, R., & Prasetyo, L. B. (2019). Partisipasi masyarakat dalam pengelolaan ekowisata berbasis konservasi. Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan, 9(2), 215–226.

Marlier, M. E., DeFries, R. S., Voulgarakis, A., Kinney, P. L., Randerson, J. T., Shindell, D. T., & Chen, Y. (2015). El Niño and health risks from landscape fire emissions in southeast Asia. Nature Climate Change, 3(2), 131–136.

McCool, S. F., & Moisey, R. N. (2001). Tourism, recreation and sustainability: Linking culture and the environment. CABI Publishing.

Moscardo, G. (1999). Making visitors mindful: Principles for creating sustainable visitor experiences through effective communication. Sagamore Publishing.

Ostrom, E. (1990). Governing the commons: The evolution of institutions for collective action. Cambridge University Press.

Page, S. E., Siegert, F., Rieley, J. O., Boehm, H. D. V., Jaya, A., & Limin, S. (2002). The amount of carbon released from peat and forest fires in Indonesia during 1997. Nature, 420(6911), 61–65.

Pretty, J. (2003). Social capital and the collective management of resources. Science, 302(5652), 1912–1914.

Putri, R. A., & Kurniawan, A. (2021). Dampak pencemaran lingkungan terhadap keberlanjutan destinasi wisata alam. Jurnal Pariwisata Berkelanjutan, 8(1), 45–60.

Rahmawati, S., Nugroho, I., & Utomo, S. D. (2021). Perilaku wisatawan terhadap lingkungan di kawasan wisata alam. Jurnal Ilmu Lingkungan, 19(3), 310–318.

Sadad, A., & Yoswaty, D. (2022). Analyze of Sustainability of Ecotourism in Bukit Tiga Puluh National Park in Riau Province, Indonesia. International Journal of Sustainable Development & Planning, 17(7).

Sadad, Abdul, Zulkarnaini Z, Mashur D, & Nasution, MS (2024). Ekowisata dan Pemberdayaan Masyarakat di Taman Nasional: Sinergi untuk Keberlanjutan. Pekanbaru: Taman Karya

Sari, D. P., Hapsari, M., & Wibowo, A. (2022). Manajemen limbah pariwisata di kawasan ekowisata pesisir. Journal of Coastal Environmental Studies, 4(1), 28–37.

Sloan, S., Campbell, M. J., Alamgir, M., Lechner, A. M., Engert, J., & Laurance, W. F. (2019). Hidden challenges for conservation and development along the Trans-Papuan economic corridor. Environmental Science & Policy, 92, 98–106.

Stronza, A., & Gordillo, J. (2008). Community views of ecotourism. Annals of Tourism Research, 35(2), 448–468.

Tacconi, L. (2016). Preventing fires and haze in Southeast Asia. Nature Climate Change, 6(7), 640–643.

Scheyvens, R. (1999). Ecotourism and the empowerment of local communities. Tourism Management, 20(2), 245–249.

Walhi Riau. (2020). Kondisi Lingkungan Hidup Riau: Kajian dan Advokasi. Pekanbaru: Wahana Lingkungan Hidup Indonesia.

Weaver, D. B. (2001). Ecotourism as mass tourism: Contradiction or reality?. Cornell Hotel and Restaurant Administration Quarterly, 42(2), 104-112.