

An Analysis of Challenges, and Prospects of Overcrowding and Heritage Small Island as a Tourism Destination: Pulau Lengkang, Batam Case Study

I Wayan Koko Suryawan¹, Sapta Suhardono^{2*}, Iva Yenis Septiariva³, Yosef Adicita⁴, Wisnu Prayogo⁵
(Received: 13 January 2024 / Revised: 17 February 2024 / Accepted: 9 March 2024)

Abstract—This paper explores Pulau Lengkang, an island near Batam City, known for its natural beauty and cultural heritage. It examines the impact of overcrowding on its aspiration to become a prominent tourism heritage destination. The main goal is to analyze the strengths, weaknesses, opportunities, and threats Pulau Lengkang faces in its development into a renowned tourist hub, with a focus on the challenges of overcrowding and the potential for sustainable tourism. The study employs a qualitative approach, relying on thorough literature review to understand the island's unique cultural and historical aspects and the implications of increasing visitor numbers on its heritage and environment. The findings reveal that while Pulau Lengkang boasts significant cultural and historical appeal, overcrowding threatens to strain its infrastructure and dilute its heritage. However, opportunities for sustainable tourism and cultural preservation present viable pathways to enhance its tourism appeal and support local community well-being. The study suggests that adopting eco-tourism and cultural engagement strategies can help safeguard Pulau Lengkang's heritage and promote sustainable development.

Keywords—Pulau Lengkang, Overcrowding, Heritage Tourism, Cultural Preservation, Sustainable Models, Batam Tourism, Tourism Challenges.

I. Introduction

The increasing globalization and accessibility of travel have made tourism one of the fastest-growing industries worldwide [1], [2]. As travelers become more adventurous, seeking unique experiences away from conventional tourist hubs, lesser-known destinations are gaining prominence. Pulau Lengkang, a small island within the jurisdiction of Batam City in Indonesia's Riau Archipelago, stands as one such emerging destination [3]. While its proximity to the bustling metropolis of Singapore and the central Batam Island places it in a strategic location, Pulau Lengkang remains relatively untouched. Historically, the island's residents primarily engaged in fishing, with minimal external influences. This gave the island a distinct cultural identity, complemented by its pristine natural environment [4], [5]. However, as word of its beauty and unique cultural experiences spreads, there's been a noticeable uptick in tourist interest.

The allure of such uncharted territories for travelers is undeniable. They offer authentic cultural experiences, untouched landscapes, and an escape from crowded tourist destinations. However, these places, by being

lesser-known, often lack the infrastructure and policies to manage a sudden influx of tourists [6]. This challenges small islands like Pulau Lengkang, where resources and the environment are fragile. The balance between promoting tourism, a potential boon for the local economy, and ensuring sustainable and responsible growth is delicate. Many destinations globally have grappled with the adverse impacts of unregulated tourism growth, including environmental degradation, cultural erosion, and strains on local resources [7], [8].

Recognizing these challenges and the potential of Pulau Lengkang as a significant tourist destination, this study aims to delve into the island's strengths, weaknesses, opportunities, and threats in tourism. By understanding these dynamics, the objective is to craft informed policy recommendations that ensure Pulau Lengkang's growth as a tourist hub is sustainable, resilient, and beneficial for visitors and the local community. Pulau Lengkang, in its current state, grapples with a limited tourism infrastructure. Reaching the island and moving within its parameters can often be challenging, further compounded by the island's lack of basic amenities like proper sanitation, consistent water supply, and an effective waste management system. This often detracts potential tourists despite the island's inherent beauty and unique cultural offerings. The local

I Wayan Koko Suryawan, Department of Environmental Engineering, Faculty of Infrastructure Planning, Universitas Pertamina, Jl. Teuku Nyak Arief, RT.7/RW.8 Jakarta, 12220, Indonesia, i.suryawan@universitaspertamina.ac.id
Sapta Suhardono, Environmental Sciences Study Program, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Jl. Ir Sutami No.36 Surakarta, 57126, Indonesia, sapta.suhardono@staff.uns.ac.id

Iva Yenis Septiariva, Faculty of Engineering, Universitas Sebelas Maret, Jl. Ir Sutami No.36 Surakarta, 57126, Indonesia, ivayenis@gmail.com
Yosef Adicita, Faculty of Engineering, Universitas Universal, Indonesia, yosef.cita@gmail.com
Wisnu Prayogo, Department of Building Engineering Education, Universitas Negeri Medan, Medan 20221, Indonesia. Email: wisnuprayogo@unimed.ac.id

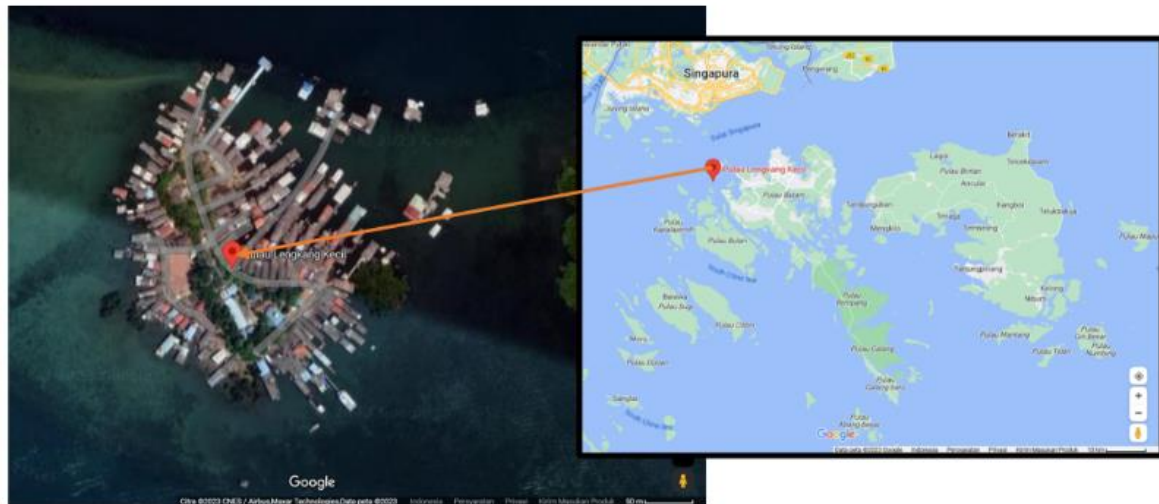


Figure 1. Study Location

traditions and the genuine way of life on Pulau Lengkang are undoubtedly significant attractions. However, they remain under-promoted and have yet to integrate into a comprehensive tourism framework fully.

Contrasting this with the island's potential, one envisions an easily accessible Pulau Lengkang with many transport systems, a range of accommodation options, and modern amenities that ensure tourists enjoy a comfortable and memorable stay. Additionally, a sustainable and eco-friendly environment and robust conservation efforts can make the island a benchmark for sustainable tourism. Imagine a space where tourists not only experience the pristine beauty of nature but also deeply engage with local culture, traditions, and crafts in a manner that brings mutual respect and tangible economic benefit to the local community. Collaboration between the local government, the private sector, and potentially even international bodies could be instrumental [9], [10] in bridging these gaps. The rich cultural heritage of Pulau Lengkang [11], [12] can be showcased through workshops, local fairs, and tours, giving visitors an immersive experience beyond the island's natural beauty. By understanding and methodically addressing these gaps, Pulau Lengkang can transition from a lesser-known island to a coveted, sustainable tourist destination, offering visitors a blend of natural beauty and rich cultural immersion.

II. Method

This research employs a qualitative methodology, drawing extensively from existing literature to deeply understand and assess Pulau Lengkang's potential and challenges as a tourist attraction. We opted for a literature-focused qualitative approach because it facilitates a deep dive into the historical background, context, and elements shaping the tourism landscape in Pulau Lengkang. This method eliminates the need for on-the-ground data gathering.

Pulau Lengkang (Fig. 1) is a petite, yet significant island located within the territorial boundaries of Batam City. Batam itself is a part of the Riau Archipelago in Indonesia, known for its rapid industrial growth and as a bustling transport hub. However, Pulau Lengkang stands apart

from the urbanized canter and is nestled away, offering a more serene and traditional experience. Geographically, Pulau Lengkang is positioned adjacent to Batam, providing an interesting juxtaposition of rapid urban growth and preserved local traditions. The island's proximity to Batam City, one of the fastest-growing cities in Indonesia, and its strategic location near international borders, makes it an intriguing location for both socio-economic and cultural studies. Pulau Lengkang's topography is defined by its coastal features, with the sea playing a dominant role in shaping the island's physical and cultural landscape. A significant portion of the local community has, over the years, constructed stilt houses, locally termed as "rumah panggung," which are erected directly over the sea. This unique architectural feature not only reflects the community's adaptation to their marine environment but also their deep cultural roots and historical connection to the sea.

The island's atmosphere is in stark contrast to the buzzing city life of Batam. The rhythms of daily life here are more attuned to the natural cycles of the sea, with fishing playing a vital role in the local economy. This confluence of nature, tradition, and the looming shadow of urban sprawl makes Pulau Lengkang a significant location for examining the interactions between development, heritage, and environmental sustainability.

The initial phase involved a thorough literature search. Sources encompassed governmental publications, prior research reports, news articles, academic journals, and other documentation relating to Pulau Lengkang's tourism evolution. Each found literature was identified, documented, and subsequently analyzed to ensure its relevance to the study's focus. Once all pertinent literature was amassed, a content analysis process ensued. This consisted of a deep dive into the sources, noting key points, and synthesizing information to identify significant themes, patterns, and emergent trends. Within the scope of the literature, SWOT analysis was deemed an apt methodology for organizing the accumulated data [13], [14]:



Figure 2. Pulau Lengkang Gate

1. The Strengths of Pulau Lengkang as a tourist destination were discerned by evaluating literature highlighting the island's unique characteristics and attractions.
2. The Weaknesses were identified by reviewing literature discussing infrastructure challenges, accessibility issues, and potential environmental concerns.
3. The Opportunities were explored by scrutinizing literature offering insights into potential sustainable tourism development initiatives or other endeavors that could enhance Pulau Lengkang's allure.
4. The Threats were pinpointed by analyzing literature spotlighting external factors that might impede tourism growth or cause detriment to the local environment and culture.

Integrating findings from the literature study with the SWOT analysis, this research succeeded in cultivating a comprehensive portrayal of Pulau Lengkang as a tourist hotspot. The outcome of this analysis will serve as a foundational bedrock for policy recommendations, aiming to optimize Pulau Lengkang's tourism potential while ensuring its sustainability for the foreseeable future.

III. Results and Discussion

A. Housing

The homes in Pulau Lengkang (Figure 2) predominantly semi-permanent or non-permanent structures, often built as "rumah panggung". "Rumah panggung" is an Indonesian phrase that refers to stilt houses or houses built on elevated platforms [15], [16]. In Pulau Lengkang, these elevated homes are constructed directly over the sea. This design is both a cultural tradition and a practical response to the island's topography and tidal conditions. Building homes on stilts over the water provides several advantages for the inhabitants. Firstly, it allows for natural cooling, as the sea breeze can flow freely beneath and around the house, making the living conditions more comfortable in a tropical climate. Secondly, it offers protection from flooding during high tides or heavy rainfalls, essential in coastal or low-lying areas prone to flooding. Additionally, having homes over the water provides direct access to the sea, which is convenient for communities that rely on fishing or marine activities for their livelihood [17].

However, these semi-permanent or non-permanent structures might also indicate challenges in stability, durability, and resistance to extreme weather conditions. Being non-permanent means, they may not be as robust as concrete structures, potentially requiring regular maintenance and repair. Over time, external factors like rising sea levels, strong waves, or even human-induced factors like increased marine traffic could affect the integrity of these stilt homes.

Current Conditions

Pulau Lengkang, situated under the jurisdiction of Sekanak Raya in the sub-district of Belakang Padang, epitomizes the resilience and challenges of small island life in Indonesia. Many of its inhabitants rely on fishing, drawing their livelihood from the intimately connected sea. One of the main challenges in the past was the limited fresh water supply. Residents had to innovate by sourcing water from Pulau Asam, where they had constructed five wells. However, recent developments have led to an established water supply in Pulau Lengkang, alleviating this challenge. On the education front, Pulau Lengkang is equipped with just one primary school, and plans for establishing higher-level schools have faced barriers, particularly concerning the availability of teachers. Nevertheless, there's a silver lining with support from the Batam city government, which provides transportation assistance for students continuing their studies on other islands. Additionally, constructing a dormitory in Belakang Padang for high school students signifies hope and commitment towards education. Given the rising number of students, there's also an increasing demand for expanding religious education facilities, reflecting the community's aspirations for secular and spiritual learning.

Pulau Lengkang is depicted as a small island recognized for its art, situated near the bustling city of Batam [11], [12]. Although in proximity to major urban areas, it retains a simple way of life, evident from its modest infrastructure and the challenges its inhabitants face. With approximately 800 residents, this island has limited access to essential utilities. Water availability is season-dependent, with adequate supply primarily during the rainy season. Electricity, another essential utility, flows only for a limited duration each day. The unique cultural and infrastructural characteristics of Pulau Lengkang can be attributed to:

1. Kesenian, or art, often thrives in limited environments. The constraints in Pulau Lengkang might have given rise to unique artistic expressions, mirroring its inhabitants' daily lives and struggles.
2. Its location near significant urban centers like Batam and even internationally recognized hubs like Singapore does not influence its way of life. The island represents a world where happiness and wealth may be measured in material assets, community, culture, and experiences.
3. The limited hours of electricity supply indicate a significant constraint in energy sources. This factor likely shapes the daily routines, work methods, and social interactions of Pulau Lengkang's residents.
4. A heavy dependence on the rainy season for water supply suggests adaptive strategies might have been developed to manage and conserve water during drier periods.

Pulau Lengkang is an intriguing case study for understanding how communities can flourish and maintain their unique identities despite challenges. It also emphasizes the importance of sustainable resource management and infrastructure development in remote areas. Environmental issues in Batam, particularly concerning small islands like Pulau Lengkang, highlight broader challenges many growing urban areas surrounding smaller islands face. Here's a breakdown of these issues:

1. As a smaller island off central Batam Island, Pulau Lengkang's limited transportation connections can strain the delivery of essential services and goods, especially those related to waste management. Insufficient transportation can hinder the efficient export of waste or the import of recycling and waste treatment resources, leading to local accumulation.
2. Proper sanitation is critical to human health and environmental conservation [3]. Without adequate facilities, there's a risk of contamination of land and water, which can then affect marine ecosystems. These issues can rapidly intensify on a small island like Pulau Lengkang, given the proximity of human settlements to the marine environment.
3. Waste management is vital on islands with limited land space [18]–[20]. Waste can accumulate without efficient disposal, collection, and recycling systems, polluting the land and the surrounding marine environment. Marine debris, which includes waste originating from the island and washed ashore from elsewhere, directly threatens marine life. Marine creatures can ingest plastics and other non-biodegradable materials, entangle them, or disrupt entire marine ecosystems. Moreover, marine debris can impact the aesthetic value of the island's beaches, affecting potential tourism opportunities.
4. Overcrowding can intensify all the issues above [18], [21]. A denser population produces more

waste and places greater demands on sanitation infrastructure. This population pressure can make it even more challenging to maintain a clean and healthy environment.

Addressing these environmental challenges on Pulau Lengkang requires a targeted approach, given its unique characteristics and constraints. Solutions might involve a mix of improved transportation infrastructure, investments in sanitation, community-based waste management initiatives, and sustainable urban planning that considers the island's size and capacity [22], [23]. Collaboration between local authorities, the community of Pulau Lengkang, and external agencies will be crucial in bringing about positive change.

B. Environmental Challenges

Pulau Lengkang, a gem in the expansive Indonesian archipelago, epitomizes the allure and challenges of lesser-known islands striving for tourist recognition. Its proximity to the thriving Batam City could be perceived as an advantage, but the actual scenario, painted with nuances, hints at a more intricate tapestry of challenges. This brings another critical aspect: the island's carrying capacity [8]. The allure of a smaller island is its intimacy, its untouched aura. But this also means it has a finite capacity. There's a genuine risk that the island might face overcrowding in pursuing economic gain, stretching its resources thin and affecting its environment and inhabitants. Interwoven with these tangible concerns are the intangible challenges related to culture and society. Tourists usher in a wave of cultural exchange, which can be enlightening. Still, there's always the lurking danger of misinterpretations or overshadowing local customs and traditions. The island's history, traditions, and way of life are its soul, and they must be showcased and protected. Moreover, an over-reliance on tourism can be a double-edged sword. While it promises economic revival, putting all eggs in the tourism basket can make the island's economy vulnerable to global fluctuations, seasonal changes, or unforeseen events.

Furthermore, the tourism industry demands a varied skill set [24]. A spectrum of services is involved, from managing accommodations to curating tour experiences. Whether the local inhabitants of Pulau Lengkang are equipped or have access to the necessary training to cater to these demands is another concern. Lastly, in an age dominated by digital narratives, the perception of a destination can shape its success. Pulau Lengkang, while naturally beautiful, faces stiff competition. Crafting its unique narrative and ensuring it resonates with potential tourists is another challenge on its journey to becoming a sought-after destination. To encapsulate, Pulau Lengkang's journey towards tourism prominence is riddled with both opportunities and challenges. Striking a balance between development and sustainability [25], [26], ensuring local inclusivity, and narrating a



Figure 3. SWOT Analysis

compelling story is crucial. With a well-thought-out approach, this island holds the potential to not just shine in the tourism realm but to redefine sustainable tourism for others to emulate.

C. SWOT Analysis

Pulau Lengkang's charm lies in the depth of its unique cultural experience and potential for eco-tourism, both of which are becoming increasingly sought-after in the global tourism landscape. Regarding the unique cultural experience, Pulau Lengkang is a treasure trove. Being a lesser-known destination, it hasn't succumbed to the pressures of commercial tourism. Instead, it offers a genuine glimpse into a way of life untouched by external influences. Visitors can immerse themselves in the island's traditions, beliefs, and values. This immersion extends to engaging with the local community, partaking in the local cuisine prepared using age-old recipes and appreciating traditional arts and crafts preserved over generations. Each of these elements provides a window into the island's rich history and the soul of its inhabitants. Equally compelling is Pulau Lengkang's potential in the realm of eco-tourism. With its pristine environments, including untouched beaches, clear waters, and diverse marine life, the island sets a perfect backdrop for travelers seeking a more conscious and nature-centric experience. But it's not just about the raw beauty. Pulau Lengkang has the potential to pioneer conservation initiatives and programs in which tourists can actively participate. There's an opportunity to prioritize sustainable practices in infrastructure development [27], [28]. The island can attract environmentally conscious travelers by using sustainable materials, renewable energy sources, and water-saving technologies. Furthermore, by integrating educational components into the tourism experience, like guided tours and workshops about local ecology [29], [30], visitors can gain deeper insights into the natural wonders of Pulau Lengkang. And importantly, true eco-tourism ensures that the local community feels the

benefits. Involving island inhabitants in tourism activities, be it as guides or artisans, ensures that tourism revenue empowers the community and reinforces the importance of preserving their natural and cultural heritage. Together, these strengths position Pulau Lengkang as a desirable destination and pave the way for a sustainable tourism model that can set a benchmark for other destinations worldwide.

The allure of Pulau Lengkang as a potential tourist destination is undeniable. However, several challenges might impede its growth and appeal to tourists, chief among them being limited infrastructure. To function seamlessly, tourist destinations require a well-laid-out infrastructure ranging from accommodations to amenities like public transport and health facilities. For Pulau Lengkang, the absence of such infrastructure can deter many tourists who seek comfort and convenience during their trips. Even the most adventurous travelers, initially drawn to the island's untouched charm, might find it challenging without the basic amenities. This lack of infrastructure not only affects the tourist experience but can also put a strain on the island's resources as the influx of tourists grows.

Furthermore, accessibility issues compound the challenges faced by Pulau Lengkang. Proximity to a major urban center, like Batam City, should ideally make the island more accessible. However, without robust transportation links, it becomes difficult for potential tourists to reach Pulau Lengkang. Effective and efficient transportation is fundamental to any tourist destination's success, especially for islands. It's not just about getting to the island but also about navigating it once there. Inadequate transportation can detract from the overall experience, making it less likely for tourists to recommend the destination to others or even consider returning. Lastly, environmental concerns are forefront of global discourse, especially in travel and tourism. Existing issues on Pulau Lengkang, such as challenges with waste management, marine debris, and sanitation, are

detrimental to the island's ecosystem and directly impact the tourist experience. In an age where travelers are becoming increasingly eco-conscious, these environmental challenges can significantly diminish the island's appeal. Additionally, without proper management and conservation measures in place, the very natural beauty and pristine environments that attract tourists to Pulau Lengkang in the first place might be under threat.

Pulau Lengkang, with its inherent charm and potential, is poised at a crossroads where its direction can lead to significant growth and development in the tourism sector. One of the most apparent opportunities lies in infrastructure development. As the island gains recognition and attracts more visitors, there's a pressing need and an opportunity to develop infrastructural facilities that cater to this influx [3], [18]. Moreover, the global trend in tourism is rapidly shifting towards sustainability [31]. This shift provides Pulau Lengkang with a golden opportunity to position itself at the forefront of sustainable tourism. The island's natural beauty and unspoiled environment are its most significant assets. By adopting and promoting sustainable tourism practices, the island can preserve its pristine environment and attract a segment of travelers who prioritize eco-friendliness in their travel choices. Sustainable tourism isn't just about conservation; it's about involving the local community [32], [33], ensuring they benefit from tourism revenues, and integrating them into the tourism model, creating a harmonious balance between visitors and inhabitants. Lastly, cultural tourism is another avenue brimming with potential for Pulau Lengkang. The island's unique way of life, traditions, arts, and crafts offer tourists a rich tapestry of experiences [11], [12]. By highlighting and promoting these cultural aspects, Pulau Lengkang can differentiate itself from other destinations. Organizing cultural festivals, workshops, and interactive sessions with the local community can provide tourists with an immersive experience [34], allowing them to connect with the island on a deeper level. Such connections often lead to meaningful travel experiences that tourists cherish and share, further boosting the island's reputation.

Pulau Lengkang, in its journey to becoming a recognized tourist destination, must also be wary of the shadows that loom, representing potential threats that could undermine its growth and unique charm. The phenomenon of over-tourism is a double-edged sword that many destinations have grappled with. While increased footfall brings economic growth, it can also strain the local ecosystem, resources, and infrastructure. For a place like Pulau Lengkang, where the environment is one of its main attractions, the detrimental effects of over-tourism could be magnified. Hand in hand with over-tourism is the potential threat of cultural erosion [35], [36]. As more tourists come in, there might be pressures to cater to their expectations and preferences, sometimes at the cost of local traditions and values. There's a risk that the unique cultural fabric of Pulau Lengkang could be diluted or commercialized, making it lose its authenticity. This could manifest in various ways, from traditional arts and crafts being replaced by mass-produced souvenirs to local culinary delicacies making way for more 'global' cuisines. The essence of what makes the island special, its cultural

heart, could be at risk. Lastly, the world of tourism is fiercely competitive, and external competition is a significant threat.

IV. Conclusion

The conclusion drawn from the analysis of Pulau Lengkang's potential as a tourist destination underscores the delicate balance between leveraging its strengths and addressing its vulnerabilities. The island's untouched natural beauty and deep-rooted cultural heritage stand as its most significant assets, attracting visitors in search of authentic experiences. Yet, the path to realizing its tourism potential is fraught with challenges, primarily due to inadequate infrastructure and environmental sustainability concerns.

Pulau Lengkang's journey towards becoming a renowned tourist hub is shaped by a complex interplay of strengths, weaknesses, opportunities, and threats. The strength lies in its natural and cultural richness, offering a unique proposition in the crowded tourism market. However, weaknesses such as insufficient infrastructure and potential environmental degradation hinder progress, posing risks to both the visitor experience and the island's ecological balance. Opportunities for sustainable tourism development present a way forward, suggesting that Pulau Lengkang can grow as a destination that honors its heritage while embracing modernity. Initiatives focused on eco-tourism and cultural preservation can harness the island's strengths, turning potential weaknesses into areas for strategic development. The threat of overcrowding and its associated impacts necessitates a thoughtful approach to tourism management, emphasizing the need for infrastructure that supports sustainable growth without compromising the environment.

References

- [1] P. L. K. Mustika, M. Ichsan, and H. Booth, "The Economic Value of Shark and Ray Tourism in Indonesia and Its Role in Delivering Conservation Outcomes," *Frontiers in Marine Science*, vol. 7, 2020, [Online]. Available: <https://www.frontiersin.org/articles/10.3389/fmars.2020.00261>.
- [2] M. Y. Sheresheva, "The Russian tourism and hospitality market: new challenges and destinations," *Worldw. Hosp. Tour. Themes*, vol. 10, no. 4, pp. 400–411, Jan. 2018, doi: 10.1108/WHATT-04-2018-0027.
- [3] Y. Adicita, I. W. K. Suryawan, and M. R. Apritama, "Design of Centralized Wastewater Sewerage System in Small," *J. Community Based Environ. Eng. Manag.*, vol. 4, no. 1, pp. 15–24, 2020, [Online]. Available: <https://journal.unpas.ac.id/index.php/temali/article/view/2250/1163>.
- [4] A. K. Harahap, "Kondisi ekosistem terumbu karang di perairan sekitar Pulau Batam, Riau," 2004.
- [5] A. Pratomo, D. Abdillah, and Y. Agustinus, "Struktur Komunitas Makrozoobentos Sebagai Indikator Kualitas Perairan Di Pulau Lengkang Kecamatan Belakang Padang Kota Batam Provinsi Kepulauan Riau," *J. Kelaut. Univ. Marit. Raja Ali Haji*, 2013.
- [6] P. M. Falcone, "Tourism-Based Circular Economy in Salento (South Italy): A SWOT-ANP Analysis," *Social Sciences*, vol. 8, no. 7, 2019, doi: 10.3390/socsci8070216.
- [7] Isdarmanto, D. R. Susanto, and A. Kiswanto, "Tourism Branding: A Strategy of Regional Tourism Sustainability Post COVID-19 in Yogyakarta," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 704, no. 1, p. 12003, 2021, doi: 10.1088/1755-1315/704/1/012003.
- [8] A. D. Sutrisno, Y.-J. Chen, I. W. Suryawan, and C.-H. Lee,

- “Establishing Integrative Framework for Sustainable Reef Conservation in Karimunjawa National Park, Indonesia,” *Water*, vol. 15, no. 9, 2023, doi: 10.3390/w15091784.
- [9] J. C. Ferreira, R. Monteiro, L. Vasconcelos, C. M. Duarte, F. Ferreira, and E. Santos, “Perception of Citizens Regarding Marine Litter Impacts: Collaborative Methodologies in Island Fishing Communities of Cape Verde,” *Journal of Marine Science and Engineering*, vol. 9, no. 3, 2021, doi: 10.3390/jmse9030306.
- [10] A. KC, “Ecotourism in Nepal,” *Gaze J. Tour. Hosp.*, vol. 8, pp. 1–19, 2017, doi: 10.3126/gaze.v8i0.17827.
- [11] S. Madonna, “Bentuk Pertunjukan dan Fungsi Kesenian Dzikir Bermadah di Pulau Lengkang Kecamatan Belakang Padang,” *Fakultas Ilmu Sosial*, 2023.
- [12] F. Feriyansyah and W. Widyanarto, “Analisis Bentuk Penyajian Kesenian Dikir Kepri Bermadah Oleh Sanggar Saidina Ali, Pulau Lengkang,” *Danc. Theatr. Rev. J. Tari, Teater, dan Wayang*, vol. 5, no. 2, pp. 46–50, 2022.
- [13] N. K. Arismayanti, “Branding Strategy of Tourism in Bali Based on Cultures and Heritage,” *Int. Sci. Soc. Sci. Eng. Energy Conf.*, no. Table 1, pp. 1–14, 2017.
- [14] S. Sumarmi, D. Arinta, A. Suprianto, and M. Aliman, “The development of ecotourism with Community-Based Tourism (CBT) in Clungup Mangrove Conservation (CMC) of tiga warna beach for sustainable conservation,” *Folia Geogr.*, vol. 63, no. 1, pp. 123–142, 2021.
- [15] M. Alifuddin, A. Alhamuddin, A. Rosadi, and E. Ariwidodo, “Understanding Islamic Dialectics in The Relationship with Local Culture in Buton Architecture Design,” *Karsa J. Sos. dan Budaya Keislam.*, vol. 29, no. 1, pp. 230–254, 2021.
- [16] H. Asriningpuri, “The sustainable built environment maintained by the Betawian traditional house’s faithfulness in local wisdom,” in *IOP Conference Series: Earth and Environmental Science*, 2020, vol. 402, no. 1, p. 12004.
- [17] N. Kuty, “Permanent Housing Reconstruction in Post Tsunami Reconstruction in Aceh, Indonesia: Quality vs. Quantity,” *Int. J. Acad. Res. Bus. Soc. Sci.*, vol. 9, no. 6, pp. 851–866, 2019.
- [18] Y. Adicita *et al.*, “Kajian Pengelolaan Sampah Perkotaan pada Pulau Kecil Padat Penduduk di Pulau Lengkang, Kota Batam,” *J. Wil. dan Lingkungan.*, vol. 10, no. 3, pp. 1–11, 2022.
- [19] G. Prajati and S. Widiatoro, “Identifikasi Kualitas Air Laut Terkait Pengelolaan Sampah Di Pulau Lengkang Kecil,” *Jtera (Jurnal Teknol. Rekayasa)*, vol. 4, no. 2, pp. 203–208, 2019.
- [20] Y. Adicita, G. Prajati, D. Darwin, I. W. K. Suryawan, M. R. Apritama, and A. Silmi, “Edukasi peduli sampah sedari dini untuk anak-anak pulau lenggang, kota batam,” *Altruus J. Community Serv.*, vol. 1, no. 2, pp. 71–80, 2020.
- [21] M. R. Apritama, I. W. K. Suryawan, and Y. Adicita, “Analisis Hidrolis dan Jejak Karbon Jaringan Distribusi Air Bersih di Pulau Kecil Padat Penduduk (Pulau Lengkang Kecil, Kota Batam),” *J. Teknol. Lingkung.*, vol. 21, no. 2, pp. 227–235, 2020, doi: 10.29122/jtl.v21i2.3807.
- [22] I. W. K. Suryawan and C.-H. Lee, “Community preferences in carbon reduction: Unveiling the importance of adaptive capacity for solid waste management,” *Ecol. Indic.*, vol. 157, p. 111226, 2023, doi: <https://doi.org/10.1016/j.ecolind.2023.111226>.
- [23] I. W. K. Suryawan and C.-H. Lee, “Citizens’ willingness to pay for adaptive municipal solid waste management services in Jakarta, Indonesia,” *Sustain. Cities Soc.*, vol. 97, 2023, doi: <https://doi.org/10.1016/j.scs.2023.104765>.
- [24] D. S. Al Jahwari, E. Sirakaya-Turk, and V. Altintas, “Evaluating communication competency of tour guides using a modified importance-performance analysis (MIPA),” *Int. J. Contemp. Hosp. Manag.*, vol. 28, no. 1, pp. 195–218, 2016, doi: 10.1108/IJCHM-02-2014-0064.
- [25] A. Marselina, E. Leha, and M. K. Ota, “Exit Survey Kepuasan Wisatawan Terhadap Pariwisata di Labuan Bajo,” *J. Master Pariwisata*, vol. 6, p. 389, 2020, doi: 10.24843/jumpa.2020.v06.i02.p08.
- [26] M. Ruano, C.-Y. Huang, P.-H. Nguyen, L.-A. T. Nguyen, H.-Q. Le, and L.-C. Tran, “Enhancing Sustainability in Belize’s Ecotourism Sector: A Fuzzy Delphi and Fuzzy DEMATEL Investigation of Key Indicators,” *Mathematics*, vol. 11, no. 13, 2023, doi: 10.3390/math11132816.
- [27] A. Nicolas, H. Hidalgo, M. B. Fresnido, I. G. P. Mangku, and I. G. B. Udayana, “Melitourism Potential of Bali, Indonesia and Bicol, Philippines,” *Asia Pacific J. Sustain. Agric. Food Energy*, vol. 10, no. 1, pp. 8–14, 2022, doi: 10.36782/apjsafe.v10i1.137.
- [28] B. S. Thompson, “Ecotourism anywhere? The lure of ecotourism and the need to scrutinize the potential competitiveness of ecotourism developments,” *Tour. Manag.*, vol. 92, p. 104568, 2022, doi: <https://doi.org/10.1016/j.tourman.2022.104568>.
- [29] C.-H. Lee, Y.-J. Chen, Y.-S. Huang, and C.-W. Chen, “Incorporating Integrative Perspectives into Impact Reduction Management in a Reef Recreation Area,” *Water*, vol. 12, no. 1, 2020, doi: 10.3390/w12010111.
- [30] I. Adam, “Tourists’ perception of beach litter and willingness to participate in beach clean-up,” *Mar. Pollut. Bull.*, vol. 170, p. 112591, 2021, doi: <https://doi.org/10.1016/j.marpolbul.2021.112591>.
- [31] A. Rosyidie, S. Sagala, M. M. Syahbid, and M. A. Sasongko, “The Current Observation and Challenges of Tourism Development in Batur Global Geopark Area, Bali Province, Indonesia,” *IOP Conf. Ser. Earth Environ. Sci.*, vol. 158, no. 1, 2018, doi: 10.1088/1755-1315/158/1/012033.
- [32] C. Garau, G. Desogus, E. Orrù, and C. Loggia, “A Theoretical Framework for Climate Change Adaptation Participatory Planning in Vulnerable Coastal Zones BT - Computational Science and Its Applications – ICCSA 2023 Workshops,” 2023, pp. 246–268.
- [33] P. Agamuthu, S. B. Mehran, A. Norkhairah, and A. Norkhairiyah, “Marine debris: A review of impacts and global initiatives,” *Waste Manag. Res.*, vol. 37, no. 10, pp. 987–1002, May 2019, doi: 10.1177/0734242X19845041.
- [34] N. Duxbury, F. E. Bakas, T. Vinagre de Castro, and S. Silva, “Creative tourism development models towards sustainable and regenerative tourism,” *Sustainability*, vol. 13, no. 1, p. 2, 2020.
- [35] N. Mateoc-Sirb *et al.*, “Sustainable Tourism Development in the Protected Areas of Maramureș,” Romania: Destinations with High Authenticity,” *Sustainability*, vol. 14, no. 3, 2022, doi: 10.3390/su14031763.
- [36] K. Bolton, “How ‘over-tourism’ has impacted the host destinations environment, culture and economy and developing a model, with global applications, to manage these challenges,” *CHME*, 2020.