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Sustainable Marine Tourism Development in the Era of Society 5.0: Assessing Environmental, Social, And Technological Impacts on Labuan Bajo

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Abstract:- Marine tourism in Labuan Bajo, Indonesia, has become an attractive destination for both international and domestic tourists, thanks to its stunning natural beauty. However, currently, the implementation of marine tourism in Labuan Bajo is still far from the concept of sustainability based on Society 5.0. Despite the immense potential, significant challenges also arise. Limited digital infrastructure, a lack of investment in advanced technology, and insufficient training for the workforce are some of the obstacles that need to be addressed. Furthermore, regulations supporting sustainability are not yet optimal, and awareness of the importance of environmental conservation and inclusivity in the tourism experience needs to be heightened. Stricter monitoring and evaluation are required to measure progress and the impact of efforts toward Society 5.0-based marine tourism. Through collaboration among the government, private sector, and local communities, Labuan Bajo has the potential to become a model for more sustainable marine tourism that benefits all stakeholders. In conclusion, the journey towards a Society 5.0-based sustainability concept still requires further efforts in Labuan Bajo.

Keywords: Development; Environmental; Labuan Bajo; Marine Tourism; Society 5.0; Sustainable

1. Introduction

Indonesia has a rich maritime history that once earned it the reputation of being a Maritime Nation. In ancient times, the Bugis tribe, known for their exceptional sailing skills, embarked on explorations of distant foreign lands. Additionally, the formidable naval fleets of the Sriwijaya and Majapahit kingdoms left an indelible mark on history (Matsuda, 2012). Beyond its maritime culture, Indonesia possesses one of the world's largest marine wealth reservoirs. Its marine environment is exceptionally diverse, owing to its location at the convergence of tectonic plates, setting it apart from other nations. However, as time has passed, it appears that Indonesia's maritime identity has faded

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somewhat (Rintelen et al., 2017). Despite its abundant marine resources, there has been a shift away from this maritime heritage. Today, it's becoming increasingly evident that Indonesia is losing touch with this part of its heritage. Geographically, Indonesia is inherently a maritime nation, composed of a vast archipelago surrounded by oceans, strategically situated between the Indian and Pacific Oceans. Indonesia's total expanse covers 7.81 million square kilometers, with 2.01 million square kilometers of land and a staggering 3.25 million square kilometers of oceans.

Indonesia stands as a remarkable hub of marine biodiversity, housing millions of species, including an impressive variety of coral species. Approximately 600 different types of coral adorn an expansive area of roughly 7,500 square kilometers, scattered across its vast archipelago. However, data from the Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia/LIPI), reported in 2017, paints a mixed picture of the state of these coral reefs. Only 6.39 percent of them were found to be in excellent condition, with 23.40 percent in good condition, 35.06 percent in fair condition, and 35.15 percent in poor condition. These findings were gathered from 108 locations and 1,064 stations scattered across Indonesia's extensive waters (Elfidasari et al., 2012).

Beyond its rich marine biodiversity, Indonesia, as an archipelagic nation, holds enormous potential for marine tourism, particularly on its smaller islands. The country boasts a vast sea area spanning 3.257 million square kilometers and a coastline stretching over 99,093 kilometers. It's home to 590 coral species, 2,057 reef fish species, and 463 shipwreck sites, all of which serve as attractions for various forms of tourism, including educational, underwater, conservation, and scientific diving tourism. Additionally, the marine tourism villages situated on these small islands offer diverse opportunities for cultural tourism (Phelan et al., 2020). The wealth of marine life and the array of natural and artificial attractions within its seas can play a pivotal role in national development, particularly in the advancement of marine tourism (Karani and Failler, 2020).

Marine tourism has become a significant economic sector worldwide, contributing significantly to economic growth, employment, and coastal infrastructure development. While this sector has generated substantial economic benefits, significant environmental impacts and social challenges have emerged as primary concerns. In an era increasingly influenced by high technology, the concept of Society 5.0 emerges as a promising framework for addressing these challenges and promoting sustainable marine tourism development (Roblek et al., 2020).

Society 5.0 is a concept originating from Japan that depicts a vision of a society integrating high-level technologies, such as artificial intelligence (AI), the Internet of Things (IoT), and data analytics, to achieve significant advancements in various aspects of human life. Society 5.0 is not merely about driving technological progress but also aims to enhance the quality of life, societal well-being, and environmental preservation (Kasinathan et al., 2022). In the context of marine tourism, Society 5.0 brings new potentials and significant opportunities. Advanced technologies can be used to monitor the marine environment more effectively, enhance natural resource management, and improve visitor experiences. Furthermore, the integration of technology in marine tourism can broaden accessibility, increase local community participation, and foster sustainable development (Byrd, 2007).

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This article aims to investigate how the development of sustainable marine tourism can be integrated with the concept of Society 5.0 and how this integration impacts environmental, social, and technological aspects. In this regard, the article covers several key points. First, how existing marine tourism can be integrated with the Society 5.0 concept. This section discusses how high-level technologies associated with Society 5.0, such as IoT sensors, real-time data analytics, and artificial intelligence, can be used to enhance the management of the marine environment, including monitoring water quality, climate change, and wildlife conservation. Second, the social impacts of sustainable marine tourism development. This section explores how the development of sustainable marine tourism affects local communities, including changes in livelihoods, improved quality of life, and the preservation of local culture. Third, challenges and constraints in technology integration. This section discusses how data security issues, regulatory policies, and levels of community involvement can influence the success of technology integration in the development of sustainable marine tourism.

We used Labuan Bajo as the observational sample for this research. Labuan Bajo is one of the priority destination areas with the potential to become a marine tourism village that offers marine attractions. However, there is a lack of understanding among the local community regarding the values of tourism and maritime culture, which could be sources of economic improvement on two islands in Labuan Bajo, namely Papagarang Island and Komodo Island. The current level of understanding is quite low, highlighting the need to increase the community's knowledge and awareness of tourism. This would help foster maritime cultural values and become a driving force for the development of coastal communities, leveraging local wisdom. The aim is to enhance community knowledge and build maritime cultural values in alignment with Labuan Bajo's potential, ultimately leading to an improvement in the economic well-being of the community in the marine tourism village.

Through multidisciplinary analysis encompassing environmental, social, and technological aspects, this article aims to provide deeper insights into the crucial role of Society 5.0 in shaping the future of sustainable marine tourism. By understanding the impact and potential of technology integration in this sector, this article contributes to the evolving discourse on how we can achieve the right balance between economic growth, environmental preservation, and social well-being in marine tourism.

2. Literature Review

2.1. Sustainable Tourism Development

Tourism is a field where achieving a harmony in environmental management is essential for both its functioning and growth. Consequently, any development efforts should take into account the environment's capacity to sustain such growth. These efforts should aim to promote equilibrium, enhance the resilience of the ecosystem, and refrain from causing harm to the environment. Sustainable tourism is now a global imperative and a guiding principle for the future of tourism development worldwide (Bank, 2021). The United Nations World Tourism Organization (UNWTO) has made it clear by providing recommendations and manuals for the implementation of sustainable tourism development. It is crucial for every country and region to gradually embrace this approach in their

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tourism development efforts. Sustainable development serves as the primary framework for tourism managers to consider when it comes to the natural environment, built environment, and socio-cultural environment, ensuring that these resources are utilized responsibly in the development process.

This concept represents an ideal framework for tourism development, emphasizing the need for a well-balanced approach among economic, environmental, and socio-cultural aspects during the development process. This approach facilitates the sustainable and responsible utilization of tourism resources without causing harm or depleting their intrinsic value. The ultimate goal is to ensure that economic interests, such as commercialization, are aligned with conservation efforts to guarantee that these resources remain available for future generations to enjoy.

The Sustainable Tourism Charter recommended by UNWTO outlines the following principles and objectives:

1. Tourism development should be based on sustainability criteria that can be ecologically supported in the long term, economically viable, and ethically and socially fair for local communities.
2. Tourism should contribute to sustainable development and be integrated with the natural environment, culture, and humanity.
3. Governments and competent authorities, with the participation of civil society organizations and local communities, should take action to integrate tourism planning as a contribution to sustainable development.
4. Governments and multilateral organizations should prioritize and strengthen support, both directly and indirectly, for tourism projects that contribute to environmental quality improvement.
5. Areas with vulnerable environments and cultures, both now and in the future, should receive special priority in terms of technical cooperation and financial assistance for sustainable tourism development.
6. Promotion/support for various forms of alternative tourism that align with the principles of sustainable development.
7. Governments should support and participate in the creation of networks for research, information dissemination, and knowledge transfer on tourism and sustainable tourism technology.
8. The establishment of sustainable tourism policies requires support and an environmentally friendly tourism management system, feasibility studies for sector transformation, and the implementation of various pilot projects and international cooperation programs.

Dodds and Joppe (2001) in Toronto introduced the concept of "Green Tourism" with four key elements: (i) Environmental Responsibility, this element emphasizes the importance of environmental protection to ensure the long-term sustainability of the regional ecosystem. It highlights the need for tourism to be environmentally responsible and minimize its negative impact on the environment; (ii) Local Economy, Tourism development should actively support the economic sustainability of the local community. This means that tourism should contribute to the well-being of the local economy by creating job opportunities and fostering economic growth; (iii) Cultural Diversity, in tourism development, it's essential to showcase and celebrate the cultural richness of the community. This element encourages the preservation and promotion of the local culture, traditions, and heritage as part

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of the tourism experience; (iv) Experiential Richness: To enhance competitiveness and sustainability, tourism should offer experiential activities that actively engage visitors with the environment, society, and culture of the region. This means providing opportunities for tourists to immerse themselves in the local experience. These four elements of "Green Tourism" aim to promote sustainable tourism practices that not only benefit the environment but also contribute positively to the local economy and culture while providing engaging experiences for tourists.

2.2. Marine Tourism in the Era of Society 5.0

Society 5.0 is a concept that originated in Japan and represents the fifth stage in the evolution of human society and technological advancement. It is a vision of a highly advanced society driven by technology that seeks to reconcile economic progress, social well-being, and environmental sustainability (Rojas et al., 2021). Society 5.0 builds upon the previous stages of human development, including:

1. Society 1.0 (Hunter-Gatherer Society): The earliest human societies were primarily focused on hunting, gathering, and survival. They relied on basic tools and lived in small, nomadic communities.
2. Society 2.0 (Agrarian Society): The development of agriculture marked the transition to Society 2.0. Humans began cultivating crops, domesticating animals, and forming settled communities. This led to the growth of civilizations and the establishment of more complex social structures.
3. Society 3.0 (Industrial Society): The Industrial Revolution marked the shift to Society 3.0. It was characterized by mass production, urbanization, and the widespread use of machinery. This era brought about significant advancements in manufacturing and infrastructure.
4. Society 4.0 (Information Society): With the advent of computers and the internet, Society 4.0 emerged. Information and communication technologies became central to daily life, enabling the rapid exchange of data and the development of digital economies.

Now, in Society 5.0, technology is deeply integrated into all aspects of society (Deguchi et al., 2020). Here are some key features and principles associated with Society 5.0:

1. Technological Integration: Society 5.0 envisions a seamless integration of advanced technologies like artificial intelligence (AI), the Internet of Things (IoT), big data analytics, and robotics into everyday life. These technologies are used to enhance the overall human experience and solve complex societal challenges.
2. Human-Centered Design: Society 5.0 places a strong emphasis on human well-being. Technology is harnessed to improve the quality of life, address social issues, and ensure that the benefits of technological advancements are accessible to all members of society.
3. Sustainability: Environmental sustainability is a core principle of Society 5.0. Advanced technologies are leveraged to mitigate environmental issues, promote renewable energy sources, and create sustainable solutions for resource management and conservation.
4. Inclusivity: Society 5.0 aims to bridge the digital divide and ensure that technology benefits all segments of society, including marginalized communities and the elderly.

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5. Economic Growth: While prioritizing human well-being and sustainability, Society 5.0 also seeks to drive economic growth through innovation, entrepreneurship, and the development of new industries and markets.
6. Smart Cities and Infrastructure: Smart city concepts are a key component of Society 5.0, where urban areas are designed to optimize resource usage, improve transportation, and enhance the overall quality of life for residents.
7. Healthcare Advancements: Advances in medical technology and healthcare services are a central aspect of Society 5.0, with a focus on personalized medicine and preventive healthcare.

Japan has been a leading proponent of the Society 5.0 concept, and it serves as a model for other countries looking to leverage technology for societal advancement while maintaining a strong commitment to sustainability and inclusivity. Marine tourism has become one of the key sectors in the tourism industry with significant potential to contribute to the economic growth of a region while also having positive impacts on the environment and local communities. In the era of Society 5.0, which represents the latest stage in the evolution of technology-based society, we witness how advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), and data analytics have transformed the landscape of marine tourism. The concept of Society 5.0 aims to seamlessly integrate technology into human daily life, and the marine tourism sector is no exception.

By harnessing these technologies, tourists can have a deeper and more interactive experience when exploring the beauty of the underwater world, beaches, and exotic islands. From a management perspective, technology aids in monitoring and preserving the marine environment, enabling more efficient management of natural resources. Meanwhile, local communities can experience positive impacts through increased job opportunities and income generated by the rapidly growing marine tourism sector. Thus, the integration of advanced technology in line with the concept of Society 5.0 can create a sustainable marine tourism ecosystem, enhance the quality of the tourist experience, and support the well-being of local communities. However, challenges such as data privacy, cyber security, and sustainable growth management also need to be addressed on the journey toward sustainable marine tourism in the era of Society 5.0.

3. Methodology

This research takes a qualitative approach, drawing from both primary and secondary data sources to delve into a specific tourism destination. The chosen location for this investigation encompasses the inhabited islands surrounding the Komodo National Park, situated within West Manggarai Regency. The selection of this particular destination was motivated by its recognition as one of the super-priority tourist destinations, its ease of accessibility, and the international competitiveness of the Komodo attraction. For primary data collection, field surveys were carried out within the chosen destination. These surveys encompassed various techniques, including direct observation and open interviews with a diverse range of respondents and key informants. The selection of informants followed a purposive sampling approach, with no predetermined number set for informants. This method

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ensured that a wide spectrum of individuals with valuable insights into the destination's tourism development was included in the study.

In addition to purposive sampling, a snowball technique was employed to identify informants. This technique specifically targeted community figures with a profound understanding of their village's conditions and the ongoing tourism development initiatives in the area. Complementing the primary data collection efforts, secondary data sources played a crucial role in this research. These sources encompassed policy documents related to tourism, including laws, government regulations, the National Medium-Term Development Plan, documents outlining the development of National Strategic Tourism Areas (NSTA), as well as guidelines and development concepts from the Ministry, local governments, and the Labuan Bajo Flores Tourism Authority. This combination of primary and secondary data sources provides a robust foundation for conducting qualitative research in this study. It facilitates a comprehensive exploration of the selected destination and its tourism development, offering valuable insights into the intricate dynamics at play in this context.

The analysis of qualitative data in this study followed a structured process consisting of three distinct stages: data reduction, data presentation, and verification. The initial stage, data reduction, involved the meticulous selection and simplification of data derived from various sources, including results from focus group discussions (FGDs), in-depth interviews, field notes, observations, and document studies. These diverse sets of data were condensed and synthesized into thematic writings. The objective of this data reduction phase was to refine, categorize, direct, and eliminate any extraneous or redundant information, aligning with the guidance of Huberman and Miles (2002). Moving on to the second stage, data presentation, all the gathered information and data were methodically organized into a coherent and comprehensible format. This presentation took the form of quotations or typologies within a comprehensive report, rendering the data easily readable and accessible to the intended audience. The final stage of data presentation aimed to present the information in a simplified and carefully selected format that facilitated practical usability, primarily with the goal of supporting decision-making processes. Additionally, as emphasized by Miles and Huberman, once the data had been effectively organized and presented, the subsequent step involved drawing conclusions and verifying the findings, marking a critical phase in the research process.

4. Result And Discussion

4.1. General Description of Research Locations

Labuan Bajo was originally one of the 19 villages and sub-districts in the Komodo District, Manggarai Regency, East Nusa Tenggara (NTT). Today, Labuan Bajo has been developed into the City of Labuan Bajo. The use of the name and the history of Labuan Bajo are closely tied to Flores Island – Cabo de Flores in Portuguese. Cabo de Flores translates to "Cape of Flowers," given by S.M. Cabot to refer to the eastern region of Flores. Since 1636, the name Flores has been officially used by the Governor-General of the Dutch East Indies, Hendrik Brouwer. The original name of Flores was Nusa Nipa, which means "Snake Island." From an anthropological perspective, this name is more

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meaningful due to its philosophical and cultural significance. Figure 1 below shows a map of Labuan Bajo, the Komodo Village, and the Papagarang Village.

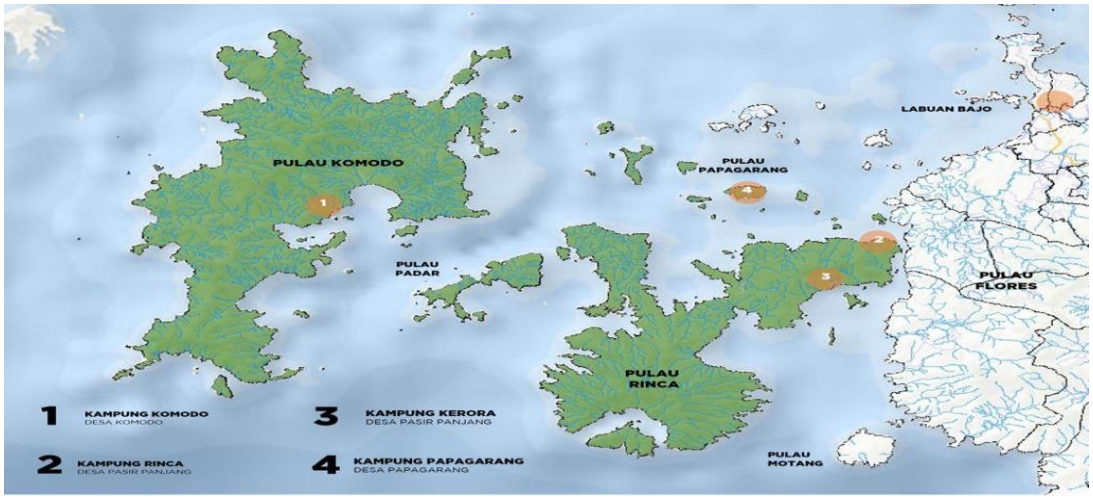

Figure 1: Location Of Labuan Bajo, Papagarang Village, And Komodo Village

One of the new Balis is Labuan Bajo. Labuan Bajo, located in East Nusa Tenggara (Nusa Tenggara Timur/NTT), has become one of the super-priority tourist destinations aiming to become a world-class destination. The government is promoting the development of tourism concepts in the Super-Priority Tourist Destinations (SPTD) or National Strategic Tourism Areas (NSTA) of Labuan Bajo, taking into account aspects of conservation and sustainability in terms of socio-cultural, ecological, and economic aspects to improve the well-being of the local community. Currently, the government is focusing on area planning and strengthening the socio-cultural transformation of the community. Activities related to the arrangement of Labuan Bajo NSTA include: (1) Arrangement of the Puncak Waringin, Batu Cermin, Waterfront Labuan Bajo, and Rinca Island areas involving the development and improvement of supporting tourism infrastructure; (2) Landscape arrangement of Labuan Bajo NSTA; (3) Development of waste management with thermal processing (Incinerator); (4) Optimization of wastewater treatment plants with a capacity of 500 households; and (5) Construction of a water supply system and piping network for Wae Mese II with a capacity of 2 x 50 liters per second to provide drinking water in Labuan Bajo NSTA, as well as a 50 m3 reservoir to serve the Loh Buaya area on Rinca Island, which sources its water from the Wae Mese water supply system.

The tourist route to Labuan Bajo utilizes both air and sea transportation. Labuan Bajo city is unique with its combination of hills, valleys, and stunning sunset views. It serves as a gateway to various tourist destinations, from mountains to the beauty of underwater landscapes, as well as island-hopping adventures by boat. Based on the results from the Labuan Bajo Authority Implementation Agency, with these tourist routes, the potential for motivating tourists to visit Labuan Bajo lies in enjoying natural, maritime, cultural, and man-made tourism experiences. The target market is

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individuals aged 22 to 40, a productive age group, who spend their leisure time traveling in groups with friends or through communities and engage in adventure activities, seeking memorable experiences during their travels.

The city of Labuan Bajo, as a premium destination, is continuously developing to create a modern city with infrastructure and facilities. One of the aspects of this development is the coastal area, particularly the fish market. This area plays a crucial role in the economic activities of the city, serving as a hub for buying and selling fish. Currently, there are ongoing efforts to organize and modernize the fish market, making it clean and seamlessly integrated with the sea. This transformation aims to provide added value, making it not only a place for trading but also a spot for photography, culinary experiences, and witnessing the bustling fish trade activities, which can be attractive to tourists.

4.2. Integration of Sustainable Marine Tourism with the Society 5.0 Concept

The utilization of technology in the tourism industry has brought about significant changes in how we plan, experience, and share our travel experiences. With the development of mobile applications, websites, and other technological innovations, travelers now have greater access to information about destinations, accommodations, transportation, and tourist attractions. They can easily plan their trips, book tickets, access interactive travel guides, and even communicate with local residents through digital platforms.

Furthermore, technology has also brought about more interactive travel experiences. Virtual reality (VR) and augmented reality (AR) allow travelers to "visit" some of the world's most iconic places without actually having to travel there physically. This also enables a deeper understanding of cultural tourism, with apps providing history, art, and local stories as we explore these places. On the other hand, technology has also assisted the tourism industry in terms of operational efficiency. Hotels and airlines utilize advanced online reservation systems, while tourist destinations use data analytics to understand traveler patterns and prepare their destinations. With the continuous advancement of technology, we can expect the utilization of technology in the tourism industry to continue to grow and innovate. This not only makes travel easier for tourists but also opens up new opportunities for entrepreneurs in the tourism industry to create more engaging, sustainable, and inclusive experiences.

Buhalis and Amaranggana (2014) stated that the rapid development of technology today has led to the concept of transforming tourism destinations into smart destinations, where destinations can leverage and integrate digital technology to enhance the traveler's experience and meet their needs before, during, and after their trip. Smart destinations encourage travelers to be highly active and create their own experiences, and these destinations can connect stakeholders to facilitate the collaborative creation of dynamic experiences, improve coordination, and foster cooperation among stakeholders.

That the existence of this program will build community capacity which will provide sustainable economic and social impacts (sustainable), so that the role of technology in people's lives will be appropriate by building a comprehensive system both in regulations and information in providing

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quality services so as to build a community. -creation or the value of togetherness in the environmental system.

Based on our observations in Labuan Bajo, Komodo Village, and Papagarang Village, these marine tourism destinations are still far from utilizing digital technologies to support their tourism operations. Therefore, there is a need for the implementation of the Society 5.0 concept for the development of these tourist villages into digital-based tourist villages. This includes:

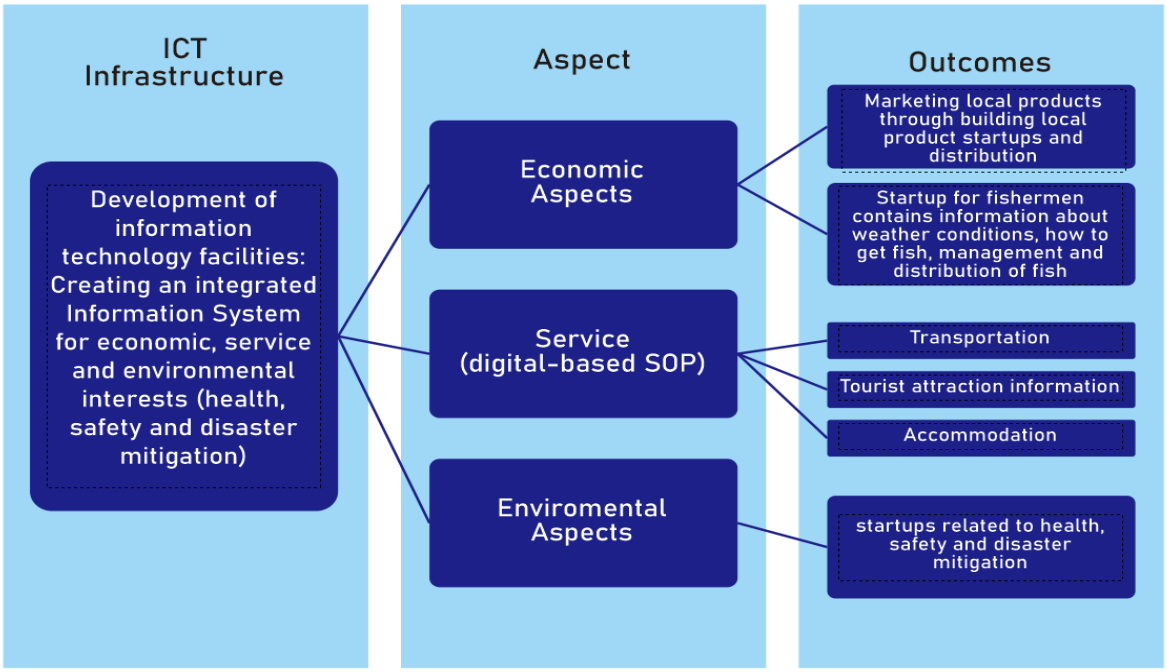

Figure 2: Society-Based Marine Tourism Framework 5.0

4.3. Social Impact of Community-Based Sustainable Marine Tourism Development 5.0

Each community possesses distinct and individualistic attributes, resulting in varying capacity development models and strategies. When dealing with indigenous communities, these distinctions become even more pronounced due to their unique cultural, geographical, social, political, and demographic characteristics. Consequently, the approach to capacity building that proves successful in one community may not be readily applicable or effective in another. In fact, attempting to impose a one-size-fits-all model on different indigenous communities can carry a significant risk of failure and potentially undermine the experiences and capabilities of the community members, as such an approach may not align with their specific needs and circumstances. Hence, it is imperative to tailor capacity development efforts to the particularities of each indigenous community to ensure their success and relevance (Ife and Tesoriero, 2008).

The rapid development of technology and the forces of globalization, which have narrowed space and boundaries, have raised concerns about the displacement and disruption of local customs and cultures. Globalization and the influence of technology on social, traditional, and local cultures

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have become significant debates in the modern era. Technology has brought about significant changes in how we interact, communicate, and go about our daily lives. In many cases, the positive impacts of technology include increased access to education, faster communication, and efficiency in various aspects of life. However, there are also negative impacts to consider, such as the loss of privacy, uneven adoption of technology, and changes in consumption culture (Jovicic, 2016).

In an increasingly digitally connected society, traditions and customs often face challenges. The younger generation may be more influenced by global culture and social media than traditional cultural values. Additionally, technology can impact traditional jobs and livelihoods, altering the social structure in certain communities. However, we can also harness technology to preserve culture and traditions. Through digital platforms, we can share and document our cultural heritage, connect younger generations with their traditions, and integrate technology with culture in positive ways. Therefore, it's important to understand that technology not only brings change but also provides opportunities to preserve and honor our cultural richness and traditions. With a thoughtful approach, we can achieve a healthy balance between modern technology and cherished cultural values.

In the era of globalization, it becomes increasingly essential to empower and preserve local culture within communities. This is because the forces of globalization often lead to cultural shifts and crises that can result in identity challenges on a global scale. Simultaneously, there is a concerning trend of excessive commodification and commercialization of culture due to the widespread influence of cultural globalization. In response to these challenges, the strategy of developing both marine tourism and culture-based tourism through community empowerment serves a dual purpose. On one hand, it aims to stimulate economic growth within the community by capitalizing on the commercial aspects of tourism. On the other hand, and perhaps more significantly, it seeks to preserve both the natural environment and the community's unique culture. This approach recognizes the importance of striking a balance between economic development and cultural and environmental preservation. By empowering local communities to actively participate in and benefit from tourism, it helps safeguard their traditions, natural resources, and way of life. This way, it becomes a holistic effort that not only boosts the local economy but also ensures the sustainability and integrity of the community's heritage and environment.

Community involvement in empowerment initiatives can manifest in different ways, either through voluntary participation driven by awareness or, in some cases, under coercion, as noted by (Sztompka, 2011). Regardless of the motivation, community participation is an integral component of the empowerment process. It plays a crucial role because when the community actively engages in these activities, it enhances the likelihood of success for such programs. Success is often attributed to the fact that when everyone is given the opportunity and means to participate, it fosters a sense of ownership and commitment to the initiatives, as highlighted by (Fischer, 2014). Numerous definitions of community participation exist within the literature, reflecting its multifaceted nature. A straightforward definition, as offered by Mikkelsen, characterizes participation as the community's involvement in endeavors related to environmental development, the improvement of their lives, and their own well-being (Adi, 2008). This definition underscores the idea that participation goes beyond mere

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involvement; it signifies active engagement and contribution by the community to shape their own destiny and development.

4.4.Challenges and Obstacles in the Development of Society-Based Marine Tourism 5.0

The need to implement Society 5.0-based marine tourism is a reflection of our evolution as an increasingly connected and technologically advanced society. Society 5.0 embraces the concept of integrating advanced technology into everyday human life, and the marine tourism sector is no exception. In this era, technologies like the Internet of Things (IoT), artificial intelligence (AI), data analytics, and advanced communication have transformed how we interact with marine and coastal ecosystems.

Marine tourism based on Society 5.0 opens up significant opportunities to enhance the tourist experience. For example, with integrated IoT sensors underwater, visitors can receive real-time information about marine life and environmental conditions, enhancing their understanding of the underwater ecosystem. Above the surface, smart mobile applications can help tourists plan their trips more efficiently, provide interactive guides to tourist attractions, and even facilitate communication with local communities.

However, it's not just about the tourist experience. Society 5.0-based marine tourism also contributes to environmental preservation. Technology used for ocean monitoring and research can assist in more sustainable management of marine resources and a better understanding of climate change. Moreover, the concept of Society 5.0 recognizes the importance of inclusivity. In the context of marine tourism, this means ensuring that these experiences are accessible to everyone, including those with physical disabilities. Technology can play a crucial role in creating greater accessibility.

Overall, the implementation of Society 5.0-based marine tourism is about creating richer, more sustainable, and inclusive tourist experiences while understanding and addressing the environmental challenges faced by our marine and coastal ecosystems. It is a step toward a future where technology and sustainability can synergize to provide significant benefits to society, tourists, and our planet.

Realizing the concept of Society 5.0-based marine tourism requires several steps and factors to be considered. Some of the things needed to achieve this goal include:

1. Digital Infrastructure: To implement advanced technologies like IoT, AI, and advanced communication, a strong digital infrastructure is needed, including fast and widespread internet connectivity in marine tourism areas.
2. Technology Investment: Investment in the development and implementation of advanced technology in the marine tourism sector is required. This includes the development of hardware and software necessary to enable IoT applications, data analytics systems, and interactive platforms.
3. Training and Skills: The workforce in the marine tourism sector needs to be equipped with the skills required to manage and leverage technology. Training and employee development are key to optimizing technology potential.

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4. Policies and Regulations: Clear regulatory frameworks governing the use of technology in marine tourism are necessary. This includes data privacy protection, cybersecurity, and stringent environmental regulations.
5. Partnerships and Collaboration: Collaboration between government, the private sector, academic institutions, and local communities is crucial. Collaboration can aid in technology development, environmental monitoring, and the promotion of sustainable marine tourism.
6. Education and Public Awareness: The public needs to be educated about the benefits of technology in marine tourism and its positive impact on the environment and culture. Education and public awareness can also contribute to environmental preservation.
7. Sustainable Environmental Management: Sustainable environmental management policies and practices are key. Technology can be used to monitor and manage marine and coastal ecosystems more effectively.
8. Inclusivity: In the development of marine tourism technology, it's important to ensure that accessibility is considered so that everyone, including those with physical disabilities, can enjoy the tourism experience.
9. Data Security: In collecting and managing data from applications and sensors, data security should be a top priority to protect the personal and sensitive information of tourists.
10. Ongoing Monitoring and Evaluation: Society 5.0-based marine tourism programs should be continuously monitored and evaluated to ensure that sustainability goals, the quality of the experience, and visitor satisfaction are achieved.

Merging advanced technology with the marine tourism sector is a crucial step toward a more sustainable and competitive future. With the right investments, strong collaborations, and a commitment to sustainability values, we can realize the vision of Society 5.0-based marine tourism that benefits all stakeholders.

Based on our research in Labuan Bajo, we present the challenges and constraints present at the research location along with recommendations that can be implemented, as seen in the following Table I.

Table 1: Swot Analysis

	Strengths	Weaknesses
Internal Factors	• Has the potential for beautiful underwater nature • A very strategic location that has attractive inter-island connectivity	• There is still low public awareness about the role of tourism and about Sapta Pesona • There is still a lack of availability of clean water • Environmental cleanliness is still low

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External Factors	• There is the Komodo National Park area which is the seven wonders of the world. • Unique architectural or building characteristics of coastal and inland areas	• There is still no understanding of the concept of a marine tourism village • There is still no management of residents' houses being used as accommodation, because they could become homestays, because this is an interesting take on maritime cultural life • The level of public education is still low
Opportunities	Opportunities – Strenghs (OS) Strategy	Opportunities -Weakness (OW) Strategy
• Increasing public awareness of maritime cultural values • Contribute to regional income • Driving the economy and providing services to the community through developing local products • The Marine Tourism Village in Labuan Bajo has the potential to become an independent tourism village by strengthening the sustainable marine tourism model system	• Determining the research direction focused on strategic issues while considering opportunities, constraints, and available funding, and conducting monitoring and evaluation of the sustainable Marine Tourism Village model in accordance with geographical and geostrategic economic characteristics. • Aligning perceptions among policymakers, planners, industry players, and technology users in determining the direction and priorities of maritime cultural development. • Aligning research directions to promote synergistic effects in science and technology activities in studies related to the development of maritime cultural values. • Developing a sustainable-based tourism concept to enhance the local economy through maritime culture with local wisdom.	• Increasing public knowledge about tourism awareness will foster a sense of belonging to the region • Increasing community capacity and competency-based human resources through training and education with the strength of maritime culture in accordance with local environmental conditions • Increasing the expansion of standards for implementing tourism industry businesses that can be created with a maritime cultural approach
Threats	Threats - Strenghs (TS) Strategy	Threats – Weakness (TW) Strategy

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• Rapid technological advancements and the continuously changing market needs. • Competition in maritime product innovation. • The presence of negative changes in socio-cultural impacts, altering behavioral patterns and the cultural values of the community, which can lead to social conflicts.	• Building awareness in the community that maritime culture with local wisdom can create competitiveness and uniqueness in maritime tourism. • Building the capacity of human resources in the village.	• Strengthening institutions and positioning the roles/functions and cooperation between the Government, industry, and the community. • Strengthening the formulation of tourism business standards when Labuan Bajo becomes a maritime tourism village destination. • Developing maritime cultural values based on local wisdom. • Developing innovation in economic and social approaches while preserving local wisdom and conservation. This means that human capital becomes the driver of economic development using technology aspects to strengthen the business economic system in the era of innovation, creativity, and productivity as well as built connectivity.

Data source: Based on observation results (2024)

5. Conclusions

This research aims to provide insights into the concept of sustainable tourism integrated with Society 5.0. We chose Labuan Bajo as the research location due to its tremendous potential for improving the local economy and government at all levels. In our conclusion, it can be summarized that the implementation of maritime tourism in Labuan Bajo, Indonesia, is still far from the Society 5.0-based sustainability concept. Although Labuan Bajo offers significant potential as an amazing maritime tourism destination, there are still many challenges in achieving sustainability and integrating advanced technology. Digital infrastructure, investments in technology, and the availability of training may not be sufficient to incorporate Society 5.0 into the maritime tourism experience in the area. Policies and regulations that support sustainability also need to be strengthened, and awareness of the importance of environmental preservation and inclusivity in the tourism experience needs to be enhanced. Stricter monitoring and evaluation are also required to ensure that Labuan Bajo can take

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bigger steps toward sustainable maritime tourism based on Society 5.0. With strong cooperation and commitment from various stakeholders, the journey toward this concept can become more sustainable and beneficial for the local community, tourists, and the environment. We acknowledge that this research has many limitations as it only presents a conceptual framework for the development of sustainable maritime tourism based on Society 5.0. Further research is needed to delve deeper into the roles of stakeholders such as the local community, government, companies, environmentalists, and other relevant parties. Empirically based research is also necessary to provide data-based evidence to convince various stakeholders.

Conflicts Of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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