



Sustainable tourism goals for Life Below Water in Labuan Bajo and Komodo National Park

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ABSTRACT

This study aims to examine the extent to which Sustainable Development Goal 14 (Life Below Water) is implemented in the marine tourism area of Komodo National Park (KNP), Labuan Bajo, Indonesia. A descriptive qualitative approach was employed, using semi-structured interviews with key stakeholders, including the Komodo National Park Authority (BTNK), local communities, the West Manggarai Tourism Office, and phinisi tourism operators. The findings indicate that despite the existence of national policies derived from SDG 14 covering sensitive environmental protection, visitor management, wildlife interaction, and species protection their implementation at the destination level remains limited. Environmental issues such as marine waste accumulation, anchor-related coral damage, and vessel-related pollution persist due to weak enforcement and fragmented stakeholder coordination. This study highlights a gap between policy frameworks and practical implementation, emphasizing the need for stronger governance integration and collaborative marine conservation in KNP.

ABSTRAK

Penelitian ini bertujuan untuk mengkaji sejauh mana Tujuan Pembangunan Berkelanjutan (Sustainable Development Goal/SDG) 14 (*Life Below Water*) diimplementasikan pada kawasan pariwisata bahari Taman Nasional Komodo (TNK), Labuan Bajo, Indonesia. Penelitian ini menggunakan pendekatan kualitatif deskriptif dengan teknik pengumpulan data melalui wawancara semi-terstruktur terhadap para pemangku kepentingan utama, yaitu Balai Taman Nasional Komodo (BTNK), masyarakat lokal, Dinas Pariwisata Kabupaten Manggarai Barat, serta pelaku usaha pariwisata kapal phinisi. Hasil penelitian menunjukkan bahwa meskipun telah terdapat kebijakan nasional yang diturunkan dari SDG 14 yang mencakup perlindungan lingkungan sensitif, pengelolaan pengunjung, interaksi dengan satwa liar, dan perlindungan spesies, implementasinya di tingkat destinasi masih belum optimal. Permasalahan lingkungan seperti akumulasi sampah laut, kerusakan terumbu karang akibat jangkar kapal, serta pencemaran dari aktivitas kapal wisata masih terus terjadi akibat lemahnya penegakan aturan dan belum optimalnya koordinasi antar pemangku kepentingan. Penelitian ini menegaskan adanya kesenjangan antara kerangka kebijakan dan implementasi di lapangan, serta menekankan pentingnya penguatan tata kelola dan kolaborasi antar pihak dalam upaya konservasi laut yang berkelanjutan di kawasan Taman Nasional Komodo.

INTRODUCTION

Sustainable tourism has emerged as a central concern in contemporary tourism development, particularly as the rapid expansion of tourism increasingly exposes tensions between economic growth, environmental limits, and socio-cultural integrity. While tourism is widely promoted as a driver of regional development, its unregulated growth has intensified ecological degradation, social disruption, and uneven economic distribution across destinations worldwide. These challenges have prompted scholars and policymakers to position sustainability not merely as a normative ideal, but as a fundamental development paradigm within the tourism sector (Hall, 2021). Sustainable tourism is commonly understood as tourism that meets the needs of present tourists and host communities while safeguarding opportunities for future generations, and it is underpinned by four interrelated pillars: economic viability, environmental protection, social equity, and cultural sustainability (Pratt, 2011).

From an economic perspective, sustainable tourism is increasingly viewed as a strategic instrument for inclusive growth and poverty alleviation, particularly in developing regions. By promoting participatory development processes and community involvement throughout planning, implementation, and destination management, sustainable tourism enables a more equitable distribution of benefits and strengthens local economic resilience. Empirical evidence from Indonesia suggests that tourism initiatives grounded in sustainability principles can enhance local livelihoods, generate employment opportunities, and foster a sense of community ownership over tourism resources, thereby contributing to long-term destination viability (Pratiwi, 2023).

Environmental sustainability constitutes a critical pillar of tourism development, especially in destinations where natural resources form the primary basis of tourism attractiveness. Environmentally responsible tourism practices emphasize ecosystem conservation, efficient resource use, and pollution prevention. A case study of the Gondang Reservoir demonstrates how an integrated tourism system combining agroforestry and fisheries can minimize resource waste, reduce environmental pollution, and generate reusable products that enhance both economic value and environmental quality (Buckley, 2020). Similar dynamics have been observed in coastal and marine tourism destinations, where insufficient management and regulatory enforcement have led to habitat degradation and biodiversity loss, highlighting the centrality of environmental stewardship in tourism governance (Garcés-Ordóñez et al., 2020; Dong, 2025).

Beyond environmental considerations, sustainable tourism also encompasses socio-cultural dimensions that are essential to destination resilience. Tourism development that respects cultural heritage, local identity, and traditional practices can reinforce social cohesion while generating economic benefits for host communities. In the Indonesian context, underline that tourism sustainability is influenced by key destination attributes, including safety, comfort, and the quality of tourism product (Rahmawati, 2022). This evidence underscores that socio-cultural sustainability is not merely a complementary element, but a core determinant of long-term tourism success (Hall, 2013).

Within this broader sustainability discourse, Indonesia has designated Labuan Bajo as a super-priority tourism destination and promoted it as a model for

sustainable tourism development. Located in West Manggarai Regency, East Nusa Tenggara, Labuan Bajo is internationally recognized for its unique natural attractions, including Komodo National Park, Padar Island, Rinca Island, Pink Beach, Manta Point, Taka Makassar, and Gili Laba. Komodo National Park is a UNESCO World Heritage Site and forms part of the Coral Triangle, one of the most biodiverse marine regions globally (Spalding, 2022). Following the COVID-19 pandemic, tourist arrivals to Labuan Bajo increased sharply, driven by renewed travel demand often referred to as *revenge tourism* (Hidayat, 2023). By 2023, tourist arrivals exceeded the initial target of 260,000 visitors, reaching 423,847 tourists, while hotel guest stays amounted to 355,836 visitors (Badan Pusat Statistik, 2023). This growth has generated substantial economic benefits across accommodation services, culinary enterprises, souvenir industries, tourism attractions, and community-based tourism initiatives.

Despite these economic gains, rapid tourism expansion has intensified environmental pressures, particularly on marine and coastal ecosystems. Numerous studies demonstrate that tourism-related activities can significantly degrade marine environments when governance mechanisms and environmental controls are inadequate (Hall, 2013; Dong, 2025). Empirical coastal waste assessments in Labuan Bajo and the Komodo National Park region reveal that plastic debris dominates stranded waste along popular beaches, indicating persistent marine pollution associated with tourism and coastal activities (WWF-Indonesia, 2018). Comparable findings from other coastal tourism destinations suggest a strong correlation between tourist density and the accumulation of marine debris (Garcés-Ordóñez et al., 2020; Galgani et al., 2015).

Plastic pollution represents one of the most critical threats to marine ecosystems worldwide. Plastics derived from petrochemical materials gradually degrade into microplastics, which persist in marine environments and accumulate in sediments and marine organisms (Browne et al., 2011; IUCN, 2021). Through ingestion by fish and shellfish, microplastics enter marine food webs and contribute to the bioaccumulation of toxic substances, posing risks to ecosystem functioning and human health (Dong, 2025; Beaumont et al., 2019).

In addition to waste-related pollution, marine tourism vessels constitute a significant source of physical and chemical disturbance. Empirical research in Indonesian coastal waters indicates that frequent vessel movement and anchoring practices contribute directly to coral reef damage, resulting in reduced coral cover and biodiversity loss (Yusri et al., 2017). Similar impacts have been documented internationally, where anchor deployment has been identified as a major driver of coral reef degradation in marine tourism destinations (Rogers & Cox, 2003). Coral reefs perform essential ecological functions as natural wave barriers and habitats for diverse marine organisms; consequently, their degradation disrupts marine food chains and undermines ecosystem stability. Furthermore, chemical pollution originating from tourism vessel fuel introduces toxic hydrocarbon compounds into marine environments. These pollutants can impair the reproduction, growth, and behavior of marine biota—particularly plankton—and may ultimately reduce fish productivity and fisheries sustainability (Darza, 2020; Beaumont et al., 2019). Collectively, these pressures point to a persistent governance gap between sustainable tourism policy commitments and their implementation on the ground.

While existing studies have extensively examined the environmental impacts of marine tourism and the normative framework of the Sustainable Development Goals (SDGs), these strands of research largely remain disconnected. Most previous studies focus either on ecological degradation in marine tourism destinations or on SDG implementation at national and policy levels. Empirical investigations that critically explore how SDG 14 (*Life Below Water*) is operationalized at the destination level through the interaction among local government authorities, tourism business actors—particularly phinisi tourism operators—and local communities within marine protected areas remain limited. This gap is especially evident in rapidly developing marine tourism destinations in developing countries, where tourism growth frequently outpaces governance capacity.

Addressing this gap is essential for understanding whether sustainable tourism policies are effectively translated into tangible marine conservation outcomes in practice. Therefore, this study aims to examine the extent to which local government institutions, phinisi tourism operators, and local communities are involved in protecting and maintaining the marine environmental quality of Komodo National Park by analyzing the interaction between policy frameworks and their practical implementation.

This study advances the literature on sustainable tourism by explicitly linking marine conservation efforts with tourism governance in the Komodo National Park area, a context that remains underexplored in existing research. It contributes by demonstrating how multi stakeholder dynamics particularly the interaction between local communities, regulatory frameworks, and tourism operators shape the effectiveness of “Life Below Water” (SDG14) implementation.

Furthermore, the study provides empirically grounded, context specific evidence from Labuan Bajo, offering a transferable analytical framework and practical reference for the marine tourism destinations facing similar tensions between conservation priorities and tourism-driven economic growth.

LITERATURE REVIEW

Sustainable destination goals

The adoption of the Sustainable Development Goals (SDGs) in 2015 marked a significant shift in global development thinking by integrating economic growth, social inclusion, and environmental protection within a unified policy framework. Unlike earlier development agendas, the SDGs emphasize interlinkages across sectors and governance scales, acknowledging that progress in one domain often depends on outcomes in others (Ruhanen et al., 2019). For the tourism sector, the SDGs provide a strategic reference for aligning destination development with sustainability objectives, particularly in environmentally sensitive regions.

Recent scholarship highlights that tourism occupies a dual position within the SDG framework. On the one hand, tourism can act as a catalyst for achieving development goals through job creation, local economic growth, and cultural exchange. On the other hand, tourism expansion may intensify environmental degradation and social pressures if not supported by effective governance arrangements (Hall, 2019). Empirical studies further indicate that SDG commitments frequently remain aspirational, as implementation at the destination level is constrained by limited institutional capacity, fragmented authority, and weak regulatory enforcement. These challenges are especially evident in developing countries, where rapid tourism growth often outpaces

the ability of local institutions to translate global sustainability agendas into operational policies (Bennett et al., 2019). This governance dilemma is particularly relevant to marine protected areas such as Komodo National Park, where tourism development intersects directly with biodiversity conservation and marine resource management.

Sustainable tourism

Sustainable tourism is increasingly conceptualized as a governance-driven approach to tourism development that seeks to balance economic viability, environmental conservation, and socio-cultural well-being. Contemporary literature emphasizes that sustainable tourism should not be understood merely as a collection of environmentally friendly practices, but rather as a comprehensive framework shaped by institutional coordination, stakeholder participation, and long-term destination resilience (Saarinen, 2018). This perspective positions sustainability as a dynamic process rather than a fixed outcome.

Empirical studies from coastal and island destinations demonstrate that sustainable tourism outcomes are strongly influenced by governance effectiveness and the degree of stakeholder collaboration. Destinations that adopt participatory planning mechanisms and enforce environmental regulations tend to experience more stable economic benefits while mitigating ecological degradation (Calgaro & Lloyd, 2019). Conversely, weak governance structures often result in implementation gaps, where sustainability principles are formally endorsed but inconsistently applied in practice. Such gaps are particularly pronounced in rapidly expanding marine tourism contexts, including Indonesia's super-priority destinations such as Labuan Bajo, where accelerated tourism development places

increasing pressure on coastal and marine ecosystems.

Marine tourism governance and stakeholder roles

The effective implementation of SDG 14 in marine tourism destinations depends largely on governance arrangements involving multiple stakeholders. Marine tourism governance refers to the institutional frameworks, regulatory instruments, and collaborative processes through which tourism activities are managed to achieve environmental sustainability (Dredge, 2021). Increasingly, scholars emphasize that governance effectiveness is shaped by the interaction among government authorities, tourism business operators, and local communities.

Local governments play a central role in translating global sustainability commitments into destination-level regulations, spatial planning policies, and enforcement mechanisms. However, empirical research in Southeast Asian marine protected areas reveals that limited institutional capacity and fragmented authority often weaken regulatory compliance and environmental monitoring (Eisma-Osorio et al., 2020). Tourism operators particularly vessel-based businesses such as liveaboard and sailing tourism directly influence marine environmental outcomes through operational practices including anchoring behavior, waste disposal, and fuel management. Studies demonstrate that insufficient oversight of tourism vessels significantly contributes to coral reef damage and water quality decline in popular marine tourism destinations (Curnock et al., 2021).

Local communities constitute another critical governance actor, as their livelihoods, cultural practices, and daily interactions are closely linked to marine ecosystems. Evidence from Indonesian

marine protected areas suggests that community participation in monitoring and conservation initiatives can enhance environmental stewardship and regulatory compliance when supported by inclusive governance frameworks (Muhammad et al., 2022). Nevertheless, integrated empirical analyses that examine how these actors collectively operationalize SDG 14 at the destination level remain limited. This gap underscores the importance of destination-focused studies that explore governance interactions and conservation practices in marine tourism settings such as Komodo National Park.

Taken together, the literature demonstrates that the achievement of sustainable tourism objectives and SDG 14 outcomes in marine destinations is contingent upon the alignment between global policy frameworks, destination-level governance arrangements, and tourism-related practices. While existing studies provide valuable insights into sustainable tourism principles, marine ecosystem conservation, and stakeholder participation, limited attention has been given to how these dimensions interact simultaneously at the destination level within marine protected areas. In particular, empirical evidence remains scarce regarding how local governments, marine tourism operators, and local communities collectively translate SDG 14 commitments into concrete conservation practices, (Khadijah, 2025). Building on these theoretical and empirical insights, this study develops a conceptual framework that integrates SDG 14 as a policy driver, governance actors as key intermediaries, and tourism practices as mechanisms shaping marine environmental outcomes in Komodo National Park. This framework serves as an analytical lens for examining the gap between sustainability commitments and their practical implementation in a rapidly expanding marine tourism destination.

Life Below Water

SDG 14 (*Life Below Water*) focuses on the conservation and sustainable use of oceans, seas, and marine resources, recognizing their essential role in climate regulation, food security, and coastal livelihoods. Marine ecosystems worldwide are increasingly threatened by pollution, habitat destruction, and unsustainable resource exploitation, many of which are intensified by tourism-related activities in coastal and marine destinations (UNESCO, 2017).

Recent studies indicate that marine pollution particularly plastic debris and vessel-related discharges remains a persistent challenge in tourism-intensive coastal areas. Research demonstrates a positive relationship between tourist density and the accumulation of marine debris, especially in destinations with inadequate waste management infrastructure (Garcés-Ordóñez et al., 2020). In addition to solid waste, vessel-based tourism activities contribute to physical damage to marine habitats, including coral reef degradation caused by anchoring and propeller scarring (Trave et al., 2017). These pressures undermine the ecological objectives of SDG 14 and highlight the need for stronger governance mechanisms to regulate tourism activities within marine protected areas. In biodiversity-rich regions such as the Coral Triangle where Komodo National Park is located these challenges pose significant risks to ecosystem integrity and long-term conservation outcomes.

Table 1 shows the 3 dimensions in the Sustainable Development Goals in point 14, namely Life Below Water based on the Regulation of the Minister of Tourism and Creative Economy/Head of the Tourism and Creative Economy Agency of the Republic of Indonesia number 9 of 2021 concerning Guidelines for Sustainable Tourism Destinations:

Table 1. Dimensions and Indicators of "Life Below Water" PERMENPAREKRAF
 number 9 of 2021

DIMENSION	INDICATOR
Sensitive environmental protection	<p>Destinations have lists of natural heritage sites and assets that include type, vulnerability status and protection efforts.</p> <p>Destinations carry out biodiversity and natural heritage conservation programs according to the scale and capacity of the destination.</p> <p>Destination has a system or program to control invasive species.</p> <p>Destinations undertake efforts to identify, monitor and mitigate the impacts of tourism on biodiversity and natural heritage.</p> <p>Destinations implement mechanisms to use tourism revenues to support the conservation of natural assets.</p> <p>Destinations communicate with visitors and business entities to reduce the spread of invasive species.</p>
Visitor management at natural sites	<p>Destinations have mechanisms to regulate the movement or flow of visitors.</p> <p>Destinations take action to manage and prevent the impact of tourism and tourism- related activities on and around natural sites.</p> <p>Destinations have behavioral guidelines for visitors on sensitive sites and distribute publications and periodically monitor visitor compliance.</p> <p>The destination has a code of practice for tour operators and tour guides and indicates their involvement in the management of visitors at natural sites.</p> <p>Destinations coordinate and collaborate with local conservation agencies to identify environmental risks from tourism and ways to overcome them.</p> <p>Destinations facilitate training for tour guides and communities.</p>
Interaction with wildlife	<p>Destinations refer to international, national and local laws regarding interactions with wildlife in the implementation of tourism activities.</p> <p>Destinations refer to and apply national and international standards for tourism activities involving wild life at sea and land.</p> <p>Destinations deploy codes of practice for interacting with wildlife, including observation, that reflect national and international standards.</p> <p>The destination has a system to check compliance with regulations and codes of practice among tourism activities.</p> <p>Destinations monitor the welfare of wild life and minimize disturbances at interaction locations.</p> <p>Destinations monitor the welfare of wild life and minimize disturbances at interaction locations.</p> <p>Destinations inform visitors about dangerous wildlife interactions, such as touching and feeding.</p>

RESEARCH METHOD

This study employs a qualitative case study approach to examine the implementation of Sustainable Development Goal 14 (*Life Below Water*) in the context of marine tourism governance in Komodo National Park. A qualitative design is appropriate for this research as it enables an in-depth understanding of governance processes, stakeholder interactions, and conservation practices within a marine protected area, where sustainability outcomes are shaped

by complex social and institutional dynamics. The research was conducted in the waters of Komodo National Park and the surrounding Labuan Bajo area, West Manggarai Regency, East Nusa Tenggara, Indonesia. This location was selected due to its status as a UNESCO World Heritage Site, a super-priority tourism destination, and a rapidly developing center of vessel-based marine tourism, particularly phinisi operations, which generate both economic benefits and environmental pressures.

Data were collected through semi-structured interviews around July 2024

with purposively selected stakeholders, including one person from officials the Komodo National Park Authority (BTNK), two persons representatives of the West Manggarai Regency Tourism Office, one person from phinisi tourism operators, and one members of local coastal communities. Interviews focused on governance roles, policy implementation, tourism practices, and efforts to protect marine ecosystems. To strengthen data triangulation, interviews were complemented by field observations and the analysis of relevant policy documents, including tourism development plans, marine conservation regulations, and SDG-related policy frameworks.

Data analysis followed the interactive model of qualitative data analysis proposed by [Miles, Huberman, and Saldaña \(2014\)](#), which consists of data condensation, data display, and conclusion drawing and verification. Interview transcripts, observation notes, and documents were systematically coded and continuously compared to identify patterns and relationships among governance actors, tourism activities, and marine environmental outcomes. This iterative analytical process allowed emerging findings to be refined and validated throughout the research process, ensuring analytical rigor and consistency with the conceptual framework ([Miles et al., 2014](#)).

To enhance research rigor, data triangulation across interviews, observations, and documents was applied, and an audit trail of data collection and analysis procedures was maintained to support the credibility and dependability of the findings ([Miles et al., 2014](#)). Ethical considerations were observed throughout the research process, including informed consent, confidentiality, and the anonymization of research participants.

RESULT AND DISCUSSION

Overview of Komodo National marine park

Komodo National Park (KNP) is located in East Nusa Tenggara, Indonesia, encompassing Komodo Island, Rinca Island, Padar Island, and several smaller islands. Covering approximately 1,733 km², with nearly 60% consisting of marine waters, KNP represents a critical marine conservation area within the Coral Triangle, one of the world's most significant centers of marine biodiversity. The Park hosts extensive coral reef systems, diverse reef fish communities, marine mammals, and several endangered species, including green and hawksbill turtles.

Despite its conservation status, interview findings reveal that the rapid expansion of marine tourism has increasingly strained KNP's governance capacity. According to the Head of the Operational Division of the Komodo National Park Authority (BTNK), the growth of vessel-based tourism—particularly phinisi operations—has outpaced monitoring and enforcement capabilities. While conservation regulations and zoning schemes are formally established, their implementation remains constrained by limited patrol coverage, human resources, and inconsistent compliance among tourism operators. This situation illustrates a persistent gap between KNP's conservation mandate and the realities of tourism-driven development.

Sensitive environmental protection

Sensitive environmental protection in the waters of Komodo National Park (KNP) is formally structured through a combination of conservation policies, zoning regulations, monitoring patrols, and environmental education initiatives. These measures are designed to safeguard vulnerable marine ecosystems from both

anthropogenic pressures and environmental change, in line with the objectives of Sustainable Development Goal 14 (*Life Below Water*). However, interview findings indicate that the practical effectiveness of these measures remains limited and unevenly implemented.

One of the primary instruments for environmental protection in KNP is the conservation zoning system established by the central government through the Ministry of Environment and Forestry (KLHK). The marine area is divided into core zones, limited-use zones, and tourism zones, each with different levels of permissible activity. Core zones are designated as fully protected areas where human activity is prohibited except for scientific research, while limited-use zones allow controlled underwater tourism activities, and tourism zones accommodate broader recreational use. Although this zoning framework aims to balance conservation and tourism utilization, interview data from the Komodo National Park Authority (BTNK) reveal that enforcement across marine zones remains inconsistent, particularly in offshore areas where surveillance capacity is limited.

Regulation of tourism activities and vessel operations constitutes another key component of sensitive environmental protection. Daily visitor quotas and restrictions on the number of tourist vessels, including phinisi boats, are formally applied to reduce ecological pressure. Tourist vessels are required to comply with operational procedures such as avoiding anchoring on coral reefs and using designated mooring facilities. Nevertheless, interview findings suggest that compliance among tourism operators is not uniform, especially during peak visitation periods when vessel density increases, thereby undermining efforts to reduce tourism-related environmental impacts.

Marine patrols conducted by forestry police (Polhut), in collaboration with BTNK and other enforcement agencies, are intended to monitor illegal fishing, coral reef damage, and environmentally harmful activities. While patrols are supported by monitoring technologies such as drones and satellite tracking, BTNK officials acknowledged that the vast marine area and limited human resources constrain effective surveillance. As a result, enforcement tends to be reactive rather than preventive, limiting its effectiveness in mitigating cumulative ecological pressures. Community involvement represents an additional strategy for environmental protection. Local communities have been engaged through conservation training and alternative livelihood programs within the tourism sector to reduce dependence on destructive fishing practices. However, interview data indicate that community-based conservation initiatives remain largely project-based and have not yet been institutionalized as a core component of marine governance, reducing their long-term sustainability.

To mitigate physical damage to coral reefs, regulations prohibit the use of anchors in sensitive areas, supported by the installation of mooring buoys at popular diving and snorkeling sites. While this measure has reduced anchor-related damage in certain locations, its effectiveness is limited by the insufficient number of mooring facilities and inconsistent use by tourism vessels. Environmental education and awareness campaigns targeting tourists, tour operators, and local communities are routinely conducted to promote responsible behavior, including waste reduction and appropriate wildlife interaction. Despite these efforts, interview findings suggest that education initiatives alone have not resulted in consistent behavioral change without

stronger enforcement and accountability mechanisms.

Temporary closures and ecosystem restoration initiatives have been considered in response to high tourism pressure in specific areas. Although such measures are recognized as important for long-term ecosystem recovery, their implementation remains selective and often constrained by economic considerations. Collaboration with international conservation organizations, such as WWF and The Nature Conservancy, supports research, restoration, and capacity-building initiatives. However, these collaborations function largely as external support mechanisms rather than as fully integrated components of day-to-day marine governance. Overall, the findings indicate that sensitive environmental protection in KNP is characterized by strong regulatory design but weak operational implementation, underscoring a persistent gap between conservation policy objectives particularly those aligned with SDG 14 (*Life Below Water*) and on-site environmental outcomes.

Visitor management at Natural Sites

Visitor management constitutes a critical mechanism for mitigating tourism pressure on sensitive marine ecosystems within Komodo National Park (KNP). The central government, through the Ministry of Environment and Forestry (KLHK) and the Komodo National Park Authority (BTNK), has formally introduced a daily visitor quota system to regulate the number of tourists entering the park. This quota is intended to reduce cumulative ecological pressure, particularly on coral reef ecosystems that are highly vulnerable to physical disturbance from snorkeling, diving, and vessel-based tourism activities. The quota system is administered through an online reservation platform, enabling real-time monitoring of visitor numbers.

However, interview findings indicate that while the system is effective in controlling official entry numbers, it does not fully account for spatial concentration of visitors at popular marine sites.

To further manage visitor distribution, KNP applies a marine zoning system that categorizes areas into core zones, limited-use zones, and tourism zones, each with distinct regulatory frameworks. Core zones prohibit tourism activities entirely to safeguard ecologically sensitive habitats, including coral reefs and critical marine species habitats. Limited-use zones permit controlled snorkeling and diving activities under supervision, while tourism zones accommodate a broader range of recreational uses. Although this zoning framework is designed to prevent overcrowding and ecological degradation, interview data from BTNK officials reveal that visitor concentration continues to occur in high-demand locations, indicating that zoning effectiveness is constrained by visitor preferences and limited enforcement capacity.

Supervision of tourism vessels represents another essential component of visitor management. Regulations prohibit tourist boats, including phinisi vessels, from anchoring directly on coral reefs, and mooring buoys have been installed at frequently visited snorkeling and diving sites. These measures are intended to prevent anchor-induced coral damage and to regulate vessel movement. Nevertheless, interview findings suggest that the limited availability of mooring buoys, combined with high vessel density during peak seasons, has resulted in inconsistent compliance among operators, reducing the overall effectiveness of this management instrument. The application of conservation fees constitutes both a visitor management and financing mechanism. Conservation fees are imposed on all visitors, with differentiated tariffs for domestic and international

tourists. These fees are intended to limit excessive visitation while generating revenue to support conservation activities, including marine patrols, infrastructure maintenance, and environmental education programs. However, interview data indicate that the allocation and reinvestment of these funds into marine conservation initiatives are not always transparent or systematically linked to specific environmental management outcomes.

Tour guides play a pivotal role in shaping visitor behavior at natural sites. In collaboration with environmental organizations, BTNK facilitates training programs for tour guides to promote compliance with environmental regulations and responsible tourism practices. Guides are expected to educate visitors on appropriate behavior, such as avoiding contact with coral reefs, minimizing wildlife disturbance, and preventing littering. Despite these efforts, interview findings reveal variability in guide capacity and commitment, suggesting that training programs have not yet translated into consistent behavioral enforcement on-site. Technological interventions have been increasingly adopted to support visitor monitoring and control. Electronic ticketing systems and online reservation platforms facilitate visitor tracking, while drones and surveillance technologies are used to observe tourist activities in remote or hard-to-access marine areas. Although these technologies enhance monitoring capacity, interview data indicate that they function primarily as observational tools and are not yet fully integrated into adaptive management systems capable of responding dynamically to visitor-induced environmental risks.

Taken together, visitor management in KNP reflects a structured regulatory framework aligned with SDG 14 (*Life Below Water*), yet its practical

implementation remains fragmented. The findings demonstrate that while mechanisms to regulate visitor numbers, behavior, and spatial distribution formally exist, their effectiveness is constrained by enforcement limitations, uneven compliance, and persistent visitor concentration at ecologically sensitive sites. This underscores a critical gap between visitor management policy design and its operational capacity to safeguard marine ecosystems under increasing tourism pressure.

Interaction with wildlife

Komodo National Park (KNP) constitutes a critical habitat for a wide range of terrestrial and marine wildlife, including the Komodo dragon (*Varanus komodoensis*), coral reef organisms, reef fish, marine megafauna, and protected marine species such as turtles and manta rays. Given the ecological sensitivity of these species, interactions between wildlife and visitors are subject to a strict regulatory framework intended to minimize disturbance, stress, and habitat degradation. These regulations are implemented through a combination of legal instruments, visitor guidelines, enforcement mechanisms, and incentive-based approaches. However, interview findings indicate that while the regulatory framework is well established, its implementation remains uneven across sites and tourism operators.

At the regulatory level, the central government through the Ministry of Environment and Forestry (KLHK), in coordination with the Komodo National Park Authority (BTNK), has issued formal rules governing visitor-wildlife interactions both on land and at sea. These include requirements to maintain safe distances from wildlife, prohibitions on feeding animals, and strict bans on touching or disturbing marine organisms such as corals, turtles, fish, and other

protected species. These regulations are aligned with national conservation laws and international wildlife interaction standards. Nevertheless, interview data from BTNK officials suggest that visitor awareness and compliance vary considerably, particularly in high-traffic tourism zones where monitoring capacity is limited.

Tour guides are positioned as key intermediaries in enforcing wildlife interaction standards. BTNK, in collaboration with conservation organizations, provides training programs aimed at equipping guides with knowledge of wildlife behavior, ethical interaction standards, and visitor management techniques. Guides are expected to actively intervene when inappropriate interactions occur, such as attempts to approach, touch, or feed wildlife. However, interview findings reveal that guide enforcement is inconsistent, largely due to varying levels of training, economic dependence on visitor satisfaction, and the absence of standardized certification requirements across operators. To ensure compliance, a range of sanctions is formally for violations of wildlife interaction regulations. These include financial penalties for tourists or operators engaging in prohibited activities, expulsion from the park for serious offenses, and legal prosecution in cases involving wildlife exploitation or significant ecological damage. Tourism operators found to repeatedly violate wildlife protection rules may also face revocation of operating permits. Despite the existence of these sanctions, interview data indicate that enforcement remains largely reactive, with penalties applied primarily following visible or reported violations rather than through systematic compliance monitoring.

In parallel, the government has introduced incentive mechanisms aimed at encouraging responsible wildlife

interaction. These include eco-friendly tourism certifications for compliant operators, priority access to restricted tourism sites for businesses demonstrating strong environmental performance, and recognition programs for tour guides, operators, and communities contributing to conservation efforts. While such incentives enhance awareness and provide reputational benefits, interview findings suggest that they function more as symbolic acknowledgements rather than as integral components of a comprehensive wildlife governance system. Taken as a whole, interaction with wildlife in KNP is governed by a robust regulatory and normative framework that reflects international and national conservation standards. However, the findings indicate a persistent gap between regulatory intent and practical outcomes. Limitations in enforcement capacity, inconsistent guide supervision, and uneven visitor compliance undermine efforts to fully safeguard wildlife welfare and minimize ecological disturbance. This suggests that while KNP has formally adopted mechanisms consistent with SDG 14 (*Life Below Water*), the operationalization of wildlife interaction governance remains insufficiently optimized to address increasing tourism pressure.

Species exploitation and animal welfare

The prevention of species exploitation and the protection of animal welfare constitute essential components of marine conservation governance in Komodo National Park (KNP). Given the park's status as a habitat for protected and endangered species, including Komodo dragons, marine turtles, manta rays, and various reef organisms, the government has established a regulatory framework aimed at preventing illegal exploitation while ensuring ethical standards of wildlife interaction. However, interview findings indicate that despite the existence of

comprehensive regulations, enforcement and monitoring remain uneven across the park.

At the regulatory level, the Ministry of Environment and Forestry (KLHK), in coordination with the Komodo National Park Authority (BTNK), has formally prohibited the hunting, capture, and extraction of wild animals for trade, consumption, or commercial purposes. These prohibitions are reinforced by species-specific regulations governing interactions with highly protected fauna, such as turtles, manta rays, and Komodo dragons. Visitors are required to maintain safe distances from wildlife and are strictly forbidden from capturing, relocating, or physically handling marine or terrestrial animals. While these regulations align with national conservation laws and international wildlife protection standards, interview data suggest that awareness among tourists and tourism operators varies considerably, particularly in high-traffic marine tourism zones.

Monitoring and law enforcement represent critical mechanisms for addressing species exploitation. Forestry police (Polhut) and BTNK officers conduct routine patrols in both terrestrial and marine areas to detect illegal activities and ensure regulatory compliance. These patrols are increasingly supported by monitoring technologies, including drones and satellite-based surveillance. Nevertheless, interview findings reveal that enforcement capacity remains constrained by the vast spatial coverage of KNP and limited human resources, resulting in selective monitoring and delayed responses to violations. Cases involving species exploitation are subject to legal follow-up, including financial penalties and detention for serious offenses; however, enforcement tends to prioritize overt violations, leaving less visible or indirect forms of exploitation insufficiently addressed. Education and

awareness initiatives are also employed to reduce exploitation pressures and improve animal welfare outcomes. Government agencies conduct outreach campaigns targeting tourists, tour operators, and local communities through informational materials, signage, and digital media. In addition, tour guides receive training on ethical wildlife interaction and conservation messaging, positioning them as frontline actors in preventing harmful visitor behavior. Despite these efforts, interview data indicate that educational initiatives alone have limited effectiveness in altering behavior when not supported by consistent enforcement and accountability mechanisms.

Regulation of tourism activities further contributes to the prevention of species exploitation. Through the application of marine zoning, authorities designate areas that are fully protected from tourism activities, thereby reducing the risk of unauthorized access to sensitive habitats. Regulations governing tourism vessels, including prohibitions on anchoring in ecologically sensitive areas and the use of mooring buoys, are intended to minimize habitat disturbance and stress to marine species. However, interview findings suggest that uneven compliance among vessel operators, particularly during peak tourism seasons, undermines the protective function of these measures. Restoration and rehabilitation programs form an additional, albeit limited, component of species and habitat protection. Habitat restoration initiatives, such as coral reef transplantation and mangrove rehabilitation, aim to repair ecosystems affected by human activity. Injured or threatened animals may be rehabilitated in designated conservation facilities before being released back into their natural habitats. While these programs demonstrate institutional commitment to conservation, interview data indicate that they remain reactive in

nature and are not systematically integrated into long-term species management strategies.

Incentive-based approaches have also been introduced to encourage conservation-oriented behavior among tourism operators and local communities. Eco-friendly tourism certifications and public recognition are awarded to operators that comply with conservation standards, while communities engaged in species monitoring or habitat restoration may receive financial support and training. Although these incentives enhance awareness and participation, interview findings suggest that their influence on reducing exploitation pressures remains limited without stronger regulatory enforcement.

Collectively, the findings indicate that species exploitation and animal welfare governance in KNP is supported by a comprehensive legal and institutional framework but constrained by implementation challenges. Limited enforcement capacity, uneven compliance, and reactive conservation responses contribute to a persistent gap between regulatory intent and on-site outcomes. This underscores that, while mechanisms aligned with SDG 14 (*Life Below Water*) are formally in place, their operationalization has not yet been optimized to effectively safeguard wildlife and marine biodiversity under increasing tourism pressure.

CONCLUSION

This study examined the implementation of marine environmental protection in Komodo National Park (KNP) through the framework of Sustainable Development Goal 14 (*Life Below Water*), focusing on sensitive environmental protection, visitor management, wildlife interaction, and species exploitation and animal welfare.

Based on qualitative evidence from key stakeholders, the findings reveal that although a comprehensive regulatory and policy framework has been formally established, its practical implementation remains uneven and insufficiently optimized. Across all dimensions, a persistent gap exists between policy design and on-site operational outcomes. Marine zoning, visitor quotas, vessel regulations, and wildlife protection guidelines demonstrate strong normative commitment to sustainable tourism; however, limitations in enforcement capacity, uneven compliance among tourism operators, and continued concentration of activities in ecologically sensitive areas undermine their effectiveness. Education, awareness, and restoration initiatives contribute positively but remain largely reactive and weakly integrated into long-term governance mechanisms.

Collaboration with international conservation organizations has supported research and capacity building efforts, yet these partnerships function primarily as supplementary support rather than embedded governance instruments. Collectively, the findings suggest that marine governance in KNP is present but not yet fully optimized. Strengthening enforcement, institutionalizing community participation, and linking conservation revenues more transparently to measurable environmental outcomes are essential to ensure that SDG 14 commitments translate into effective and sustainable marine conservation at the destination level.

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