Sea turtle management in three conservation areas of West Sumatera using EVIKA approach

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Abstrak

Penyu laut merupakan spesies kunci dalam ekosistem pesisir yang berperan penting dalam menjaga keseimbangan ekologis, khususnya mekanisme pengendalian populasi organisme laut tertentu serta mempertahankan kualitas habitat seperti padang lamun dan terumbu karang. Kehadiran penyu tidak hanya mencerminkan kondisi laut yang sehat, tetapi juga menjadi indikator keberhasilan upaya konservasi laut. Penelitian ini bertujuan untuk mengevaluasi efektivitas pengelolaan kawasan konservasi di tiga lokasi Provinsi Sumatera Barat melalui pendekatan Evaluasi Efektivitas Pengelolaan Kawasan Konservasi (EVIKA), yaitu Kawasan Konservasi Pieh di Pulau Pandan, Pulau Karabak Ketek, dan Kawasan Konservasi Ampiang Parak. Metode penelitian menggunakan analisis deskriptif terhadap capaian kriteria dan indikator EVIKA. Hasil evaluasi menunjukkan bahwa Kawasan Konservasi Pieh memperoleh status pengelolaan berkelanjutan dengan skor tertinggi pada aspek input, sedangkan Pulau Karabak Ketek dan Ampiang Parak dikategorikan sebagai kawasan dengan status dikelola optimum. Faktor utama yang memengaruhi efektivitas pengelolaan meliputi kekuatan landasan hukum, ketersediaan serta kompetensi sumber daya manusia, kapasitas kelembagaan, dan tingkat partisipasi aktif masyarakat. Oleh karena itu, penelitian ini merekomendasikan peningkatan kolaborasi banyak pihak, penguatan peran kelompok masyarakat pengawas (pokmaswas), serta penerapan sistem pemantauan partisipatif berbasis masyarakat dan adaptif terhadap dinamika perubahan lingkungan pesisir.

Kata kunci: Penyu, kawasan konservasi, EVIKA, *Marine Protected Area*, pengelolaan

Abstract

Sea turtles are keystone species in coastal ecosystems, playing an essential role in maintaining ecological balance by regulating the population of certain marine organisms and sustaining the quality of critical habitats such as seagrass beds and coral reefs. Their presence not only reflects the health of marine ecosystems but also serves as a key indicator of the success of marine conservation initiatives. This study evaluates the effectiveness of conservation area management in three sites in West Sumatera Province using the Evaluation of Marine Protected Area Management Effectiveness (EVIKA) framework, namely the Pieh Marine Protected Area on Pandan Island, Karabak Ketek Island, and the Ampiang Parak Conservation Area. A descriptive analysis was applied to assess the performance of each EVIKA criterion and indicator. The results show that the Pieh Conservation Area achieved a sustainable management status with the highest score in the input component, while Karabak Ketek Island and Ampiang Parak were categorized as "optimally managed". The effectiveness of management across these areas is influenced by several key factors, including the strength of legal frameworks, the availability and competence of human resources, institutional capacity, and the level of community participation. This study recommends enhancing multi-stakeholder collaboration, strengthening the role of community-based monitoring groups (pokmaswas), and implementing participatory monitoring systems that are community-driven and adaptive to the dynamic changes of coastal environments.

Keywords: Sea turtle, conservation area, EVIKA, Marine Protected Area*, effectiveness*

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Highlights

- EVIKA helps assess the effectiveness of management in turtle conservation areas.
- Local values and community engagement serve as the foundation for conservation efforts.
- Community involvement plays a significant role in the success of sea turtle management.

Introduction

Indonesian marine waters serve as habitats for six out of the seven sea turtle species found globally, including the green turtle (*Chelonia mydas*), olive ridley turtle (*Lepidochelys olivacea*), loggerhead turtle (*Caretta caretta*), hawksbill turtle (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*), and flatback turtle (*Natator depressus*) (Widhayanti et al., 2024). Most of these species are classified as protected and endangered (Aprilia & Rajab, 2025), as listed in the IUCN (International Union for Conservation of Nature) Red List and Appendix I of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) (Fitriani et al., 2021). Many turtle nesting grounds in Indonesia are located within tropical waters due to the country's geographic characteristics, which provide natural habitats for sea turtles (Syaputra et al., 2019). Generally, sea turtles require a range of habitat types to support different stages of their life cycle, including feeding grounds, mating areas, resting zones, and nesting beaches (Soetijono, 2019). The degradation and conversion of coastal habitats, exploitation of turtles and their eggs, and predation pressures are among the primary factors contributing to the population decline of sea turtles (Harnino et al., 2021). Furthermore, threats such as illegal hunting, habitat degradation, and bycatch remain persistent challenges in efforts to maintain stable and healthy sea turtle populations (Himpson et al., 2023).

Sea turtles are predominantly distributed across tropical regions worldwide, although some species are also capable of inhabiting areas with subtropical climates (Jemarut & Sari, 2021). The presence of sea turtles serves as a key indicator of marine ecosystem sustainability, as they contribute to the dispersal of algal and seagrass spores, which are essential for maintaining the fertility and ecological balance of seagrass beds (Rismawati et al., 2021). In Indonesia, their presence spans a wide range of islands, including turtle conservation sites located in West Sumatera Province (Suherman & Astri, 2019). These conservation areas serve as critical habitats for several endangered sea turtle species. In West Sumatera, nesting activities of leatherback turtles, hawksbill turtles, and green turtles are still commonly observed. Conservation efforts in these regions are carried out through collaborative initiatives involving government agencies, non-governmental organizations, and local communities, focusing on nest protection, minimizing human-induced threats, and promoting environmental awareness regarding the importance of turtle conservation (Yuliono et al., 2024). Research and educational outreach are also prioritized as integral components in safeguarding turtle populations and maintaining the health of coastal ecosystems. In addition to protecting sea turtles, conservation initiatives in this region also contribute to restoring the overall balance of marine ecosystems, particularly in maintaining nesting habitats and coral reef areas that function as vital feeding grounds (Hanif et al., 2022).

Recent studies on sea turtle bioecology have increasingly concentrated on conservation efforts. Key threats such as illegal hunting, habitat degradation, and incidental bycatch continue to pose serious risks to the survival of sea turtles and remain critical issues that require immediate and targeted intervention (Supriatna, 2018). Marine protected areas refer to designated aquatic zones that are managed under a zoning system to ensure the sustainable use of fishery resources and their surrounding ecosystems. The term "conservation area" encompasses not only protection, preservation, and maintenance, but also underscores the importance of sustainable utilization for the benefit of local communities residing within or near the area (Mangkurat, 2024). Although national policy frameworks provide clear guidelines for the management of conservation areas, their implementation at the local level often encounters significant challenges (Yuliana, 2017). Constraints such as limited budget allocation, weak inter-agency coordination, and low levels of community engagement frequently emerge as major obstacles to achieving effective conservation management (Sutrisno et al., 2023). To assess the effectiveness of these management efforts, the Ministry

of Marine Affairs and Fisheries has developed a framework known as the Evaluation of Marine Protected Area Management Effectiveness (EVIKA) (Sanjaya et al., 2022). This evaluation tool is intended to assist policymakers in reviewing the performance of conservation area management and in establishing priorities for future improvements (Samosir et al., 2024). By understanding the current level of management effectiveness, stakeholders are better equipped to identify areas in need of enhancement. The ultimate goal is to improve both the efficiency and effectiveness of conservation practices, thereby facilitating the achievement of long-term management objectives.

The main objective of this study is to evaluate the management effectiveness of sea turtle habitats across three governance models (national, provincial, and community-based) using the EVIKA instrument, and to identify the key supporting and constraining factors influencing conservation outcomes.

Method

This study employs the Evaluation of Marine Protected Area Management Effectiveness (EVIKA), a framework developed by the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia, to assess the effectiveness of sea turtle conservation area management. A descriptive evaluation approach was adopted in this research. The assessment was carried out using the evaluation instrument stipulated in the Decree of the Director General of Marine Spatial Management No. 28/KEP-DJPRL/2020, concerning the Technical Guidelines for Evaluating the Effectiveness of Conservation Area Management (Lumbantoruan et al., 2023). EVIKA functions through a structured scoring system in which each component is assessed based on measurable indicators. The scores obtained from these indicators are then aggregated to determine the overall level of management effectiveness, which is catagorized into qualitative classes ranging from very low to very high. This systematic approach enables the identification of management strengths, existing gaps, and areas requiring improvement, practices. This study was conducted across three conservation sites located in West Sumatera Province:

1. Pieh Marine Protected Area, managed by the Pekanbaru National Marine Conservation Area Authority (LKKPN Pekanbaru);
2. Karabak Ketek Island, which falls under the jurisdiction of the West Sumatera Provincial Marine and Fisheries Office; and
3. Ampiang Parak Conservation Area, which is actively monitored by community-based surveillance groups (Pokmaswas).

The research was conducted between September and December 2024 using a combination of document review, field observation, and semi-structured interviews with site managers and community-based surveillance groups (Pokmaswas). The evaluation followed the EVIKA instrument. This instrument consists of four major components: (1) Input, which includes regulations, management planning, and resource availability; (2) Process, referring to program implementation, coordination, and institutional governance; (3) Output, which encompasses program achievements, reports, and management products; and (4) Outcome, which assess ecological and social results such a habitat quality improvement nesting success, hatching rate, and community participation.

Results and discussion

Overview of the Study Site

Pieh Marine Protected Area (MPA)

Pieh Marine Protected Area (MPA) has been designated as part of the national marine conservation network through a decree issued by the Ministry of Marine Affairs and Fisheries.

This area is managed by the Pekanbaru National Marine Conservation Area Authority (LKKPN Pekanbaru) and includes several islands such as Bando Island, Pieh Island, Air Island, Toran Island, and Pandan Island, as stipulated in the Ministerial Decree No. KEP.70/MEN/2009 concerning the Establishment of the Pieh Island and Surrounding Waters National Marine Conservation Area in West Sumatera Province (HS & Lubis, 2018). Pandan Island serves as a critical nesting and landing site for sea turtles due to its relatively undisturbed ecological condition (Nasution & Galib, 2020) The area represents a more established model of conservation management, supported by inter-sectoral coordination, the availability of a formal management plan, and the implementation of routine monitoring activities.

Karabak Ketek Island

Karabak Ketek Island is situated along the coastal area of Pesisir Selatan Regency and exhibits considerable ecological potential as a natural habitat for sea turtles. However, it has not yet been formally designated as a national conservation area. The management responsibilities for this site are held by the Marine and Fisheries Office of West Sumatera Province. Current conservation efforts remain localized and technical in nature, involving incidental patrols and basic habitat monitoring. At present, a comprehensive management plan and a structured, long-term monitoring system are still under preparation and awaiting formal approval. One of the major challenges in advancing conservation efforts is the limited availability of financial and technical support, largely attributed to the unclear administrative status of the area.

Ampiang Parak Conservation Area

Ampiang Parak Conservation Area represents a community-based conservation initiative managed by the local surveillance group, Pokmaswas Ampiang Parak (Firdaus et al., 2024). This site is considered a model of participatory conservation practice along the coastal regions of West Sumatera. The initiative was launched by local residents in response to the declining sea turtle population caused by anthropogenic pressures (Zis et al., 2024). Although the management is independently conducted by the community, several critical challenges remain to ensure its operational effectiveness. These include limited resources, the absence of formal legal recognition, and a lack of technical guidance. Nonetheless, this initiative reflects significant potential for advancing community-based conservation efforts, particularly if supported by enabling policies and institutional assistance (Saputri & Muchtar, 2019).

Management Effectiveness Scores and Categories

The evaluation results revealed that the Pieh Conservation Area (Pandan Island) achieved the highest overall score and was classified under the “sustainable” category (Table 1). This performance can be attributed to the presence of a well-established management structure, strong institutional capacity, and consistent implementation of conservation initiatives. In contrast, Karabak Ketek Island (Table 2) and the Ampiang Parak Conservation Area (Table 3). were categorized as “optimally managed.” Although these sites have demonstrated notable progress in management practices, they still exhibit deficiencies, particularly in input components such as limited human resources and financial support. Furthermore, institutional processes and standard operating procedures remain partially documented and lack full standardization.

Table 1. Management Effectiveness Evaluation Status (EVIKA) of The Pieh Conservation Area

Criteria	Total Score	Maximum Score	Criteria Score (%)	EVIKA Final Status	EVIKA Status
Input	970	1075	90	88.12	Sustainable
Process	415	430	97		
Output	580	650	89		
Outcome	395	625	63		

Table 2. Management Effectiveness Status (EVIKA) of The Karabak Ketek Island

Criteria	Total Score	Maximum Score	Criteria Score (%)	EVIKA Final Status	EVIKA Status
Input	440	1075	42	62.98	Managed Optimally
Process	305	430	71		
Output	470	650	72		
Outcome	400	625	64		

Table 3. Management Effectiveness Status (EVIKA) of The Ampiang Parak Conservation Area

Criteria	Total Score	Maximum Score	Criteria Score (%)	EVIKA Final Status	EVIKA Status
Input	700	1075	65	59.98	Managed Optimally
Process	185	430	43		
Output	495	650	76		
Outcome	400	625	64		

The outcome component across all three sites demonstrated comparatively lower scores than the other components. In the Pieh Marine Protected Area despite its "sustainable" management status, the outcome score was only 63%. This result indicates that ecological achievements, such as hatchling success rates and juvenile survival, remain insufficiently documented or monitored. Similarly, Karabak Ketek and Ampiang Parak both record outcome scores of 64%, reflecting the weak link between management inputs and tangible ecological results. The absence of consistent turtle nesting activity in Karabak Ketek and Ampiang Parak further illustrates that management structures and processes have not yet translated into measurable improvements in turtle populations. These findings emphasize the need for long-term ecological monitoring systems, particularly for nesting activity and hatchling survival, to ensure that management effectiveness is reflected in actual conservation outcomes. The importance of long-term monitoring is also recommended by le Gouvello et al., (2020), which assesses individual size, understanding population dynamics, and supporting recovery planning and conservation practices.

Analysis of Supporting and Constraining Factors

The variation in management effectiveness across the conservation sites is influenced by several key factors. The success of the Pieh Marine Conservation Area is supported by the availability of legally recognized planning documents, the implementation of a structured monitoring system, and substantial assistance from national government institutions and non-governmental organizations. This site benefits from a well-established management framework and access to national programs such as conservation training and financial support. In contrast, Karabak Ketek and the Ampiang Parak Conservation Area face a range of challenges, including the absence of formal regulations, insufficient budget allocation, limited technical capacity of local personnel, and the lack of a comprehensive documentation and reporting system.

Furthermore, the role of local communities, particularly in Ampiang Parak has not been fully optimized, resulting in conservation efforts that are conducted individually and are not yet integrated into a long-term management strategy. Nevertheless, if critical aspects such a regulatory support, financial allocation, and community-based capacity building are systematically strengthened, both Karabak Ketek and Ampiang Parak have the potential to achieve a high category of management effectiveness within the next five to ten years. For example, a 2013 study in Malaysia found that community-based conservation is a valuable tool for educating local communities about their environmental responsibilities. They even implemented community-based conservation education plans and initiatives to strengthen conservation efforts (Mutalib et al., 2025). By optimizing education at both locations, increasing community capacity development could become an alternative long-term management strategy.

The findings of this study reveal distinct patterns in sea turtle management across three institutional frameworks: a nationally designated conservation area (Pieh), a provincially managed conservation zone (Karabak Ketek), and a community-based conservation initiative (Ampiang Parak). Each system exhibits specific strengths and limitations, reflecting the diversity of governance contexts in marine resource management.

1. **Pieh Conservation Area** exemplifies a bureaucratic-formalistic model, supported by national regulations and well-established institutional structures. Its operational effectiveness relies heavily on inter-agency coordination, comprehensive planning, and external support. While the area demonstrates considerable success in implementing conservation measures, its high dependency on centralized resources raises concerns about its resilience in the absence of national support.
2. **Karabak Ketek** is currently undergoing an institutional transition. Although it has been officially designated as a conservation area, it suffers from limited budget allocation and administrative ambiguity. This situation underscores the urgency of provincial-level policy interventions to strengthen the governance of non-national marine protected areas.
3. **Ampiang Parak**, local values and community engagement serve as the foundation for conservation efforts. The sustainability of these grassroots initiatives indicates the potential of socio-ecological approaches, despite facing legal and logistical constraints. The active involvement of the local community surveillance group (Pokmaswas) serves as a key driver, and its integration into broader formal management systems could significantly enhance conservation outcomes.

Overall, the analysis indicates that despite institutional achievements in certain areas, significant ecological and social gaps remain unaddressed. These variations across the three governance models underline the urgency of adopting adaptive and participatory strategies. Accordingly, a set of practical recommendations is proposed to enhance both governance performance and ecological outcomes in sea turtle conservation.

Strengthening the role of community-based surveillance groups (Pokmaswas) through legal recognition and technical capacity-building is essential to improve management outcomes. Establishing participatory and adaptive monitoring systems will help ensure that management practices translate into ecological improvements such a nesting and hatching success. Moreover, consistent financial support and stronger integrations of provincial and national policies are needed to enhance resilience and long term of turtle conservation. This reinforces the earlier argument by Falih et al. (2025) that sea turtle conservation can be achieved through the establishment of protected areas, legal policies, monitoring of illegal hunting and trade, and empowering local communities.

Conclusion

This study shown the variation in conservation management effectiveness across three management models in West Sumatera. The Pieh Marine Protected Area achieved a sustainable status, supported by a clear legal framework and strong institutional coordination. In contrast, Karabak Ketek and Ampiang Parak were categorized as optimally managed, yet remain constrained by limited resources, weak legal foundations, and insufficient technical capacity. Overall, management effectiveness is strongly shaped by administrative clarity, financial and technical support, institutional capacity, and the level of community participation.

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