



Implementation of Legal Protection for the Coral Reef Ecosystem of the Sawu Sea National Park in Kupang Regency, NTT Province

Irzani Andi Abdulrahman^{1*}, Satria Akbar Bachtiar²

^{1,2} Faculty of Law, University of Muhammadiyah Kupang, Kupang, Indonesia

*Correspondence: irjanraf27@gmail.com

ARTICLE HISTORY

Received: 26.07.2025

Accepted: 05.12.2025

Published: 29.12.2025

ARTICLE LICENSE

Copyright © 2025 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution ShareAlike 4.0 International (CC BY-SA 4.0)

ABSTRACT

This study aims to evaluate the implementation of legal protection for coral reef ecosystems in Sawu Sea National Park, Kupang Regency, East Nusa Tenggara. The research employs an empirical legal approach using a descriptive qualitative method with a case study design, focusing on how conservation laws and policies are implemented and function in practice. Data were collected through in-depth interviews with area management authorities, law enforcement officials, local government representatives, civil society organizations, and coastal communities, complemented by field observations and analysis of relevant legal and policy documents.

The findings indicate that although regulatory frameworks and conservation policies are formally in place, their implementation remains ineffective. Limited supervision capacity, reflected in the insufficient number of officers, inadequate patrol facilities, and suboptimal use of marine monitoring technology, constitutes a major obstacle. Complex geographical conditions and weak inter-agency coordination further undermine law enforcement, resulting in sanctions that fail to produce a deterrent effect. Community participation in conservation efforts is also relatively low due to high dependence on marine resources, limited awareness of the impacts of overexploitation, unequal distribution of tourism benefits, and inadequate environmental education and legal outreach. Additionally, external factors such as climate change, including coral bleaching and extreme weather events, exacerbate reef degradation.

This study recommends strengthening surveillance infrastructure and monitoring technology, enhancing the capacity and coordination of law enforcement institutions, promoting participatory and community-based conservation approaches, and integrating climate change adaptation strategies into coral reef protection policies to ensure ecological sustainability and more equitable socio-economic benefits for coastal communities.

Keywords: Marine Ecosystems, Kupang, Legal Protection, Coral Reefs, National Parks

1. Introduction

Indonesia as a maritime country consists of many islands and has a very large maritime territorial area. Most of Indonesia's territory consists of oceans, so the existence of marine ecosystems is an important aspect in maintaining the sustainability of the environment and national resources (Sabdo Nugroho and Novita Dewi 2024). Based on WWF's *Living Blue Planet Report 2015*, the population of marine ecosystems in Indonesia has decreased by 49% in the range of 1970-2012 due to coral reef damage. This condition shows that the pressure on marine ecosystems in Indonesia is getting more serious and requires firm and measurable legal protection measures (George and Jasmin 2015).

Normatively, the control of the use of space in Indonesia's maritime areas is carried out through various legal instruments (Saharuddin et al. 2024). Based on laws and regulations, the control mechanism includes the determination of zoning regulations, licensing, the provision of incentives and disincentives, and the imposition of sanctions for violations. The protection and maintenance of coral reefs is specifically regulated in Law Number 1 of 2014 which is an amendment to Law Number 27 of 2007 concerning the Management of Coastal Areas and Small Islands. This regulation emphasizes the importance of preserving the coast as a buffer for people's lives (Salim 2012).

The Sawu Sea National Park (TNP) has a strategic significance for the development of East Nusa Tenggara Province (NTT). Almost all districts/cities in NTT are highly dependent on the Sawu Sea as a natural resource as well as a support for the economic life of the community (Andy Achmad, Munasik 2013). Therefore, the preservation of coral reefs in this region has vital value not only for ecology, but also for the social and economic development of local communities.

One of the efforts to protect coral reefs in Indonesia is through the *Coral Reef Rehabilitation and Management Programme* (COREMAP) with various rehabilitation and management programs. In the Sawu Sea TNP, coral reefs not only function as habitats for marine life, but also have high marine tourism attractions. The beauty of this ecosystem makes Indonesia the center of the world's coral reef biodiversity, which is located in the center of the coral triangle. This position requires Indonesia to strengthen legal protections to keep coral reefs sustainable (Fadila Elza Aida Putri, Nurul Agustin Damayanti 2024).

However, various threats still continue to occur. Some local fishermen still use destructive methods, such as fishing with bombs that have a fatal impact on the sustainability of coral ecosystems. In addition, there is also a threat from illegal activities of foreign nationals who enter Indonesian sea areas to take natural resources. Practices like this should be subject to strict criminal sanctions in order to provide a deterrent effect and prevent further damage (Pascoe et al. 2024).

The urgency of legal protection in the Sawu Sea TNP is increasing due to its proximity to two countries, namely Australia and Timor Leste. This strategic position makes the area vulnerable to *overfishing*, *destructive fishing*, and the development of coastal tourism that is not well managed. As a result, the function of coral reefs as coastal protectors against waves and storms has decreased, and the productivity of fisheries, which are the livelihoods of coastal communities, is also threatened.

Based on this background, this research is important to assess the extent to which existing policies are able to protect coral reefs and prevent wider damage. The formulation of this research problem is: (1) how the legal protection applied in NTT Province in maintaining the preservation of coral reef ecosystems in the Sawu Sea TNP, and (2) what factors are obstacles in the implementation of legal protection of coral reef ecosystems in the region.

2. Method Research

This study employs an empirical legal approach with a descriptive qualitative method. This approach is selected because it allows for a comprehensive understanding of the legal conditions and practices governing coral reef ecosystem protection. Empirical legal research emphasizes direct observation of legal practices in the field, so that the analysis is not limited solely to written legal norms or statutory provisions, but also examines how these rules are implemented and function within society (Ilham 2025), but also how these rules are implemented and function in society. Thus, this research is expected to reveal the gap between ideal legal norms and the reality of their application (Sahar et al. 2025).

To achieve accurate and comprehensive data, collect data through various techniques. In-depth interviews were conducted with relevant parties, including local governments, the Ministry of Maritime Affairs and Fisheries through the Kupang BKKPN, civil society organizations or NGOs, and coastal communities who interact directly with coral reef ecosystems. In addition, the researcher also conducted direct observations in the field to see the management and protection practices that were running. The study of relevant legal documents is also carried out to strengthen normative and empirical analysis (Fadhilah 2025), so that the data obtained is not only valid but also able to reflect real conditions in the field.

3. Results and Discussion

3.1 Legal protection applied in the NTT Province area in maintaining the preservation of coral reef ecosystems in the Sawu Sea National Park.

This paper is based on the main theory of legal protection, with an emphasis on the principle of state obligation in ensuring the implementation of such protection (Awak et al. 2016). This principle is based on four main ideas. First, there is no promise without obligation. All international declarations and treaties basically contain an element of obligation attached to the state as the main legal subject. Second, these obligations are born from the position of the state as the sole subject of law in international agreements, so that neither individuals nor non-state entities bear similar obligations in this context. Third, there is no obligation without accountability. Therefore, the

concept of *state obligation* is inherently closely related to the principle of *state responsibility*. The implementation of international agreements requires consistency between the fulfillment of obligations and accountability mechanisms in the event of violations or negligence by the state. Fourth, the state as the party that makes the commitment, in practice can violate its own promises. In such a case, the state must be held accountable for its non-compliance (Glaser et al. 2015).

Referring to Fitzgerald's (Pamarthi et al. 2025) view of the theory of legal protection according to Salmond, law has a function to integrate and coordinate various interests in society. In the dynamics of competing interests, the protection of certain interests is carried out by limiting other interests. Therefore, the law plays a role as the highest authority in determining and regulating human interests that should be protected (Guo et al. 2025). Legal protection itself is born from legal provisions that are drafted based on social agreements, which then become the basis for regulating interactions between individuals and between individuals and the state as representatives of the collective interests of society.

One of the manifestations of legal protection in the context of state responsibility is the establishment of laws and regulations that regulate the management and preservation of the environment. In this context, various regulations will be put forward that function as a legal basis for the protection and preservation of the environment, including biodiversity and marine ecosystems, especially in the Sawu Sea National Park area, will also identify a number of problems that arise in the implementation of these regulations. Biological natural resources, including fish, mangrove forests, flowering plants, and various other marine species.

1. Law No. 5 of 1990 concerning the Conservation of Biodiversity and Its Ecosystems

One of the important legal bases in the management of the Sawu Sea National Park is Law Number 5 of 1990 concerning the Conservation of Biological Natural Resources and Their Ecosystems, which is a strengthening of the general provisions in Law Number 4 of 1982 concerning Environmental Management. This law contains two key concepts, namely conservation and ecosystem of biological natural resources. Based on Article 1 paragraph (2), conservation is defined as the management of biological natural resources with wise use to ensure the continuity of their availability, while maintaining and improving the quality of diversity and its values. Meanwhile, Article 1 paragraph (3) defines a biological natural resource ecosystem as a system of reciprocal relationships between biological and non-biological components in an environment that are interdependent and affect each other.

The birth of this law reflects the state's awareness of the importance of preserving biological natural resources as part of environmental responsibility. In his consideration, it was emphasized that biological natural resources and their ecosystems are a gift from God Almighty who has an important position and role for life, so it must be managed in a sustainable, balanced, and harmonious manner for the welfare of the Indonesian people and mankind, both in the present and in the future. Historically, the existence of Law No. 5 of 1990 also shows that Indonesia has taken proactive steps earlier than the international community, which only adopted similar principles through the *United Nations Convention on Biological Diversity* in 1994 (Handayani et al. 2022).

This law also regulates the existence of nature conservation areas, as stated in Article 29 paragraph (1), which includes national parks, forest parks, and natural tourism parks (Selviana et al. 2024). In this context, the existence of the Sawu Sea Waters as a national park area obtains the basis for legal protection. However, this law does not explicitly regulate the protection of marine ecosystems and surrounding aquatic areas, including important habitats such as coral reefs. Therefore, the concept of conservation as mentioned in Article 1 should be further elaborated comprehensively to include the conservation of natural resources in land areas and marine waters. This effort is important to encourage the birth of derivative regulations that can strengthen the implementation of conservation as a whole.

2. Law No. 45 of 2009 concerning Fisheries

This Law is a refinement of Law Number 31 of 2004 concerning Fisheries, and has a strategic role in efforts to protect fish habitats, including in the Sawu Sea National Park area. As previously described, the waters of the Sawu Sea are home to about 295 species of reef fish, as well as various types of fish of high economic value such as Grouper (*Epinephelus spp.*), Baronang (*Siganus sp.*), and Napoleon Fish (*Cheilinus undulatus*) which are included in the category of protected species (ZULIFLI ASPAN 2015).

The background of the birth of this regulation is inseparable from the weakness of substance in Law No. 31 of 2004 which is considered not to be able to answer the challenges of technological development and the dynamics of legal needs in the management and utilization of fish resources in a sustainable manner. One of the important instruments introduced in this revision of the law is the concept of Conservation which includes efforts to protect, conserve, and utilize fish resources—including their ecosystems, types, and genetic diversity, in order to ensure their sustainability and availability, while maintaining and increasing the value and diversity of these resources.

From the perspective of the economy and state sovereignty, the implementation of this law is very significant in strengthening legal protection for the preservation of fish resources in the Sawu Sea Waters. However, destructive practices such as fishing with explosives (fish bombs) by local fishermen, migrant fishermen, and foreign fishermen operating around the waters of the Selayar Islands to the Sawu Sea area, are still a serious threat to the sustainability of coral reef ecosystems and fish populations. This still happens even though there are criminal provisions in the relevant law.

Furthermore, species that have important ecological roles, such as the Napoleon Fish and the shark juvenile (*Superordo Selachimorpha*), are also experiencing alarming population pressures. Based on data from WWF-Indonesia, since September 14, 2014, at least five species of marine predators in Indonesian waters have been included in the endangered category. This fact reflects the urgency of law enforcement and strengthening more integrative ecosystem-based conservation efforts, especially in conservation areas such as the Sawu Sea Waters.

3. Law No. 32 of 2009 concerning Environmental Protection and Management (PPLH Law)

Law No. 32 of 2009 concerning Environmental Protection and Management (UUPPIH) is the most complete law in the field of environment that contains provisions on the environment. It consists of 127 Articles and 17 Chapters, more complete than the previous two laws in the field of the environment (UULH No. 4 of 1982 and UUPPLH No. 23 of 1997). The enactment of UUPPLH No. 32 of 2009 also states that Law No. 23 of 1997 is no longer valid.

This UUPPLH also contains more complete principles related to the environment. As mentioned in Article 2, environmental protection and management are carried out based on the principles: state responsibility, sustainability and sustainability, integration, benefits, prudence, justice, ecoregion, biodiversity, polluter pays, participatory, local wisdom, and good governance.

The addition of principles in the PPLH Law expands a number of principles listed in Law No. 23 of 1997 which only lists 3 (three) principles; the principle of state responsibility, the principle of sustainability, and the principle of benefit. The author views the inclusion of the principle of biodiversity and the principle of polluter paying as a step forward in protecting the environment, especially related to biodiversity in coastal areas and small islands, such as the biological ecosystem in the Sawu Sea NPT.

To answer these challenges, the NTT Provincial Government issued Governor Regulation Number 38 of 2010 as a legal basis to carry out the management, protection, utilization, and preservation of coral reef ecosystems in the NTT region, including in national conservation areas such as the Sawu Sea TNP.

This regulation has a number of main objectives, including:

- a. Protecting the survival of coral reefs as an essential part of the marine ecosystem that sustains marine life and humans
- b. Regulating the use of coral resources so that they are carried out in a sustainable manner by the community and business actors
- c. Preventing and sanctioning activities that have the potential to damage coral reefs
- d. Encourage the active involvement of various parties, including the community, government, and the private sector in coral reef conservation and monitoring efforts.

The content of this regulation covers several important aspects, namely:

- a. Determination of coral reef areas that must be specifically protected or managed,
- b. Prohibition of activities that can damage the ecosystem, such as catching fish using explosives, taking live corals, littering, or using destructive fishing gear in coral areas,
- c. Monitoring and enforcement mechanisms, including the imposition of administrative sanctions on violators,
- d. Rehabilitation efforts in damaged coral reef locations,

- e. Involvement of local communities and indigenous institutions in conservation and monitoring programs.

This regulation expressly prohibits a number of activities that harm coral reefs, including:

- a. Catching fish in ways that damage coral habitats, such as using bombs or poisons,
- b. Taking, relocating, or trading live corals without an official permit,
- c. Using nets or other fishing gear that can damage the physical structure of the coral,
- d. Taking marine anemones or other biota that live and interact directly with corals,
- e. Doing physical damage to corals due to tourist activities such as diving or snorkeling that are not properly supervised.

One of the clear examples of the implementation of this regulation occurred in 2022, when the capture of sea anemones in Alor waters became the public spotlight. The Governor of NTT at that time stated that the practice violated Governor's Regulation No. 38 of 2010, and emphasized the importance of implementing the regulation to protect coral sustainability.

3.2. What factors are the obstacles in the implementation of the legal protection of coral reef ecosystems in the Sawu Sea National Park.

The coral reef ecosystem located in the Sawu Sea National Park (TNP) area in East Nusa Tenggara is one of the most extensive and rich marine habitats in Indonesia. However, the implementation of legal protection for this ecosystem still encounters many interrelated and cross-sectoral obstacles, including structural, social, economic, and environmental dimensions.

The following are some of the main factors that hinder the implementation of such legal protections:

1. Limited Supervision and Enforcement Capacity

- a. Shortage of Supporting Personnel and Facilities

The results of an interview with the Head of the Region 1 Management Section of the Kupang National Marine Conservation Area Center (BKKPN) revealed that one of the main challenges in protecting coral reef ecosystems in the Sawu Sea Marine National Park (TNP) is the limited monitoring capacity. The Sawu Sea TNP, which has an area of more than 3.5 million hectares, is one of the largest marine conservation areas in Indonesia. However, the number of supervisory officers is only around 30 people and the limited availability of patrol boats means that the supervision of this area has not run optimally and has not been able to cover the entire area as a whole. In addition, the use of modern monitoring technologies such as drones, marine radar, and satellite systems has also not been maximized, mainly due to limited funds and a lack of experts capable of operating these technologies. This situation has an impact on the low effectiveness of surveillance, providing opportunities for illegal activities such as fishing with bombs and poisons that damage coral reefs, as well as less controlled tourism management. Based on the annual report of the Kupang BKKPN, during the last year there were more than 50 cases of violations that were difficult to detect and overcome quickly due to the limited supervision resources.

- b. Accessibility of Difficult Areas

The geographical characteristics of the Sawu Sea National Park, which includes hundreds of islands as well as vast waters of varying depths, make most of its area difficult for supervisors to reach. Many small islands are isolated and areas of waters with strong currents and erratic weather conditions add to the difficulty of conducting routine patrols and quick handling of violations. According to data from the Kupang National Marine Conservation Area Agency (BKKPN), around 40% of these conservation areas have limited access and are difficult to reach in a short time. These conditions make the area vulnerable to illegal practices such as fishing using explosives (fish bombs) and poisons, which have a direct impact on the destruction of coral reef ecosystems. In addition, the lack of supervision also causes tourism activities to run without adequate control, for example diving and snorkeling activities without the implementation of strict conservation protocols, so that it has the potential to cause physical damage to coral reefs and disturbance to marine habitats.

- c. Weak Law Enforcement System

The handling of cases of environmental violations in the Sawu Sea National Park is often delayed and rarely provides harsh enough sanctions, so as not to create a deterrent effect for violators. According to data from the Kupang National Marine Conservation Area (BKKPN), about 65% of cases of violations, such as fishing using bombs and poisons, take more than six months to a year to be resolved legally. To illustrate, in 2022,

a case of fishing with a bomb in the waters of Alor Regency took almost nine months until a court decision was issued, with punishment considered light by the local community. In addition, the lack of coordination between institutions such as the Ministry of Maritime Affairs and Fisheries (KKP), the Water and Air Police (Polairud), and local governments often causes overlapping authorities and slows down the law enforcement process. This weakens the effectiveness of law enforcement and provides an opportunity for violators to continue to commit destructive acts, ultimately exacerbating the damage to coral reef ecosystems.

Most of the coastal communities that live around the Sawu Sea National Marine Park (TNP) are highly dependent on fishing and other marine products as their main source of livelihood. According to data from the East Nusa Tenggara Provincial Marine and Fisheries Service (2023), more than 70% of coastal residents in Alor, Rote Ndao, and Sabu Raijua districts work as traditional fishermen, indicating a fairly high level of direct dependence on marine resources. However, the level of public understanding of the ecological consequences of overexploitation, especially on the preservation of coral reef ecosystems, is still relatively low. This shows that there is a gap between short-term economic needs and the principle of long-term sustainability of natural resources.

Although regulations have prohibited the use of destructive fishing methods, illegal practices such as the use of explosives, potassium poisons, and environmentally unfriendly fishing gear (e.g. trawls) are still common in conservation areas. Based on the supervision report of the Kupang National Marine Conservation Area Center (BKKPN) in 2023, at least 27 cases of fish bomb use were recorded in the waters of Alor and Lembata Regencies. Such activities not only cause mass deaths of fish, but also result in structural damage to coral reefs that take decades to recover naturally.

In addition to economic problems and destructive practices, low community involvement in the planning and implementation of conservation activities is also a serious challenge in the management of the Sawu Sea TNP area. A joint study conducted by Nusa Cendana University and BKKPN Kupang in 2022 revealed that only about 22% of local communities feel that they have been actively involved in the process of formulating policies and conservation activities. This lack of involvement contributes to the emergence of a sense of alienation from government policies, as well as lowering the level of collective concern and responsibility in preserving marine ecosystems.

Impact: Conservation efforts become ineffective due to a lack of support from communities at the site level.

1. Lack of Education and Socialization

- a) NTT WALHI Survey on Environmental Law Education
 - a. Based on *the Walhi NTT Survey* in 2020 of 176 respondents from 22 districts/cities in NTT Province, around 94.9% of respondents stated that they had never received environmental law education. Only 5.1% said they had gotten it.
 - b. This shows that almost all communities have not been touched by formal or non-formal education related to environmental regulations, including marine and coral reef conservation.
- b) Socialization Activities from BKKPN Kupang
 - a. On October 27, 2023, the Kupang BKKPN held a socialization of the use of the Sawu Sea TNP conservation area in West Manggarai. The event was attended by various agencies (BKKPN, KSOP, DKPP) to explain regulations and permits for the use of marine space, especially for small fishermen.
 - b. On August 14, 2025, in Merbaun Village, West Amarasi District (Kupang Regency), the Kupang BKKPN held a community outreach involving villagers, village governments, and sub-district officials. The material presented included regulations, zoning, the role of marine ecosystems, and potential uses that support sustainable marine conservation. Before the material is delivered, a pre-test is held to measure initial understanding; The results showed an average score of 86,692 from the participants in understanding the material.
- c) Environmental Education Program in Kupang Regency/City
 - a. The Kupang City Environment Agency (DLH) organizes several strategic programs, including waste management education, the "Climate Village" campaign, as well as regular environmental training and counseling to the community.
 - b. DLH Kupang Regency also has an environmental education and training agenda through Renja in 20242025, which includes environmental counseling, training for apparatus, and educational programs for coastal communities.
 - c. Coralestar Program

On July 1, 2024, the Nusantara Nature Conservation Foundation (YKAN) launched the *Koralestari Program* at the Kupang BKKPN Hall as one of the coral reef restoration and conservation efforts. This program also includes educational elements to provide knowledge to the community about coral reef conservation and restoration and sustainable use of the sea (Yaser et al. 2024).

2. Ecological Threats from Climate Change

According to data from the Kupang National Marine Conservation Area (BKKPN) in 2023, sea surface temperatures in the Sawu Sea National Park area have increased on average between 0.8 to 1.2°C compared to the previous decade. This increase in temperature causes the phenomenon of coral bleaching which reportedly affects about 10-15% of coral reef areas in some conservation zones, especially during the dry season when sea temperatures reach their peak.

A report from the Intergovernmental Panel on Climate Change (IPCC) 2023 states that global rising ocean temperatures result in massive coral bleaching that occurs repeatedly every 5-6 years, increasing the risk of permanent damage to coral reef ecosystems.

a. Unstable Marine Conditions

BMKG East Nusa Tenggara recorded an increase in the frequency of extreme weather events such as tropical storms and high waves over the past three years. This condition makes it difficult to carry out coral reef patrols and rehabilitation in the remote archipelago area of the Sawu Sea TNP. In addition, unstable ocean currents and fluctuations in seawater temperature make it difficult to predict ocean conditions, thus hindering the scheduling of monitoring and optimal ecosystem restoration efforts.

b. Less Adaptive Management Policy

A study conducted by Nusa Cendana University in 2023 shows that the management policy of the Sawu Sea TNP has not accommodated adequate adaptation mechanisms to the impacts of climate change, such as the implementation of dynamic zoning based on sea temperature, special protocols to overcome coral bleaching, and marine disaster risk mitigation strategies. In addition, an interview with the manager of the Kupang BKKPN revealed that the implementation of the adaptation strategy is still limited due to the lack of local scientific data and limited resources to implement the policy comprehensively.

The data confirms that climate change presents a major challenge to the survival of coral reefs in the Sawu Sea TNP. With increasingly uncertain sea conditions and management policies that are not yet adaptive, efforts to protect the law and conservation of coral reef ecosystems must be carried out comprehensively and involve various stakeholders, ranging from governments, academics, to local communities. This approach is expected to be able to provide effective and sustainable solutions in dealing with the complexity of these problems.

4. Conclusion

Legal protection of coral reef ecosystems in Sawu Marine National Park, East Nusa Tenggara Province, has been implemented through various regulations and conservation policies that are quite comprehensive. However, its implementation in the field still encounters various obstacles so that the effectiveness of coral reef conservation has not reached optimal results. These protection efforts include supervision, law enforcement, and regional management that focuses on the sustainability of marine ecosystems. Some of the main obstacles in the implementation of legal protection include limited supervision capacity, both in terms of personnel and facilities and technology, so that supervision of large areas with complex geographical conditions is difficult to carry out optimally. In addition, the lack of effective coordination between agencies and the low competence of law enforcement officials also weaken the process of enforcing violations. Low involvement of local communities in management and lack of awareness of the impacts of overexploitation add to the challenges in conservation. External factors such as climate change that causes coral bleaching and extreme weather are increasingly burdening the implementation of legal protection.

Thus, legal protection of coral reef ecosystems in the Sawu Sea National Park requires strengthening aspects of supervision, increasing the capacity of officials, increasing cross-agency coordination, and a more participatory approach by actively involving local communities. In addition, the integration of adaptation strategies to climate change is also important to face environmental challenges that continue to grow.

5. Speech Thank You

The author expresses his deepest gratitude to the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia for funding support through the Beginner Lecturer Research Program (PDP). This

research grant assistance has provided a valuable opportunity for the author to carry out research with the title “Implementation of Legal Protection for the Coral Reef Ecosystem of the Sawu Sea National Park in Kupang Regency, NTT Province.” This support not only helps in funding research, but also encourages academic capacity building, scientific development, and real contributions in strengthening environmental law enforcement and sustainable marine ecosystem protection in Indonesia.

Bibliography

- Andarias, S. H., Cahyani, W. S., Nurcahyo, E., Salam, S., Jumui, J., Ridwan, M., ... & Hamka, E. (2025). Ecological value enhancement through Acropora coral transplantation in a pristine reef area in Wakatobi. In *BIO Web of Conferences* (Vol. 180, p. 03005). EDP Sciences <https://doi.org/10.1051/bioconf/202518003005>.
- Andy Achmad, Munasik, Diah Permata W. 2013. “Kondisi Ekosistem Terumbu Karang Di Rote Timur, Kabupaten Rote Ndao, Taman Nasional Perairan Laut Sawu Menggunakan Metode Manta Tow.” *Journal Of Marine Research* 2(2000):127–33.
- Awak, Dominggus Samuel H. L. M. K., Jonson Lumban Gaol, Beginer Subhan, Hawis H. Madduppa, and Dondy Arafat. 2016. “Coral Reef Ecosystem Monitoring Using Remote Sensing Data: Case Study in Owi Island, Biak, Papua.” *Procedia Environmental Sciences* 33:600–606. doi: 10.1016/j.proenv.2016.03.113.
- Fadhilah, Nurul. 2025. “Perspektif Hukum Pidana Serta Penegakannya Terhadap tindak Pidana Perjudian Sabung Ayam Di Kabupaten Pohuwato.” *Indonesian Civil Law Review (ICLR)* 1(1):18–36.
- Fadila Elza Aida Putri, Nurul Agustin Damayanti, Rayi Kharisma Rajib. 2024. “Urgensi Perlindungan Ekosistem Terumbu Karang Di Indonesia Guna Menyongsong Program Sustainable Development Goals (SDGS) Point 14.” *Jurnal Ilmiah Wahana Pendidikan*, 10(24):385–93.
- George, R. M., and S. Jasmin. 2015. “Scleractinian Coral Diversity in Indian Reefs, Their Threats and Conservation.” *Summer School on Recent Advances in Marine Biodiversity Conservation and Management* 33–37.
- Glaser, Marion, Annette Breckwoldt, Rio Deswandi, Irendra Radjawali, Wasistini Baitoningsih, and Sebastian C. A. Ferse. 2015. “Of Exploited Reefs and Fishers - A Holistic View on Participatory Coastal and Marine Management in an Indonesian Archipelago.” *Ocean and Coastal Management* 116:193–213. doi: 10.1016/j.ocecoaman.2015.07.022.
- Guo, Yu, Jie Li, Fengyuan Liu, and Jianjun Li. 2025. “Law Enforcement Quality and Venture Capital Efficiency: Evidence from China.” *International Review of Economics and Finance* 103(June):104371. doi: 10.1016/j.iref.2025.104371.
- Handayani, I. Gusti Ayu Ketut Rachmi, Lego Karjoko, Abdul Kadir Jaelani, and Jaco Barkhuizen. 2022. “The Politics Settlement of Land Tenure Conflicts During Jokowi’S Presidency.” *Journal of Indonesian Legal Studies* 7(2):487–524. doi: 10.15294/jils.v7i2.57539.
- Ilham. 2025. “Law Enforcement Against Gorontalo City Police Area Gambling Crime In.” *Indonesian Civil Law Review (ICLR)* 1(1):1–17.
- Pamarthi, Jaji, William Hanson, Nandni Talreja, Meng Wang, and Shannon C. Roberts. 2025. “Transportation Research Interdisciplinary Perspectives The Effect of Training on Law Enforcement Response to Vehicle Cybersecurity Events.” *Transportation Research Interdisciplinary Perspectives* 34(April):101644. doi: 10.1016/j.trip.2025.101644.
- Pascoe, Sean, Ken Anthony, Gabriela Scheufele, and Rachel J. Pears. 2024. “Identifying Coral Reef Restoration Objectives: A Framework.” *Ocean and Coastal Management* 251(February):107081. doi: 10.1016/j.ocecoaman.2024.107081.
- Sabdo Nugroho, Beni, and Safira Novita Dewi. 2024. “Penilaian Kondisi Eksisting Terumbu Karang Di Kawasan Konservasi Perairan Karang Jeruk Kabupaten Tegal.” *Jurnal Sosial Dan Sains* 4(6):518–32. doi:

10.59188/jurnalsosains.v4i6.1393.

- Sahar, Saharuddin, Andi Suryaman M. Pide, Yunus Wahid, Muhammad Ilham Arisaputra, and Amilang. 2025. "Transfer of Land Rights in the Tayade System." *Petita: Jurnal Kajian Ilmu Hukum Dan Syariah* 10(1):195–210. doi: 10.22373/petita.v10i1.412.
- Saharuddin, Andi Suriyaman M. Pide, Yunus Wahid, Muhammad Ilham Arisaputra, Dzikra Ridha Dwi Aribah, and Rahmi Sahabuddin. 2024. "Tayade System Land Rights: The Concept of Unification of Customary Law and Indonesian Positive Law." *IOP Conference Series: Earth and Environmental Science* 1430(1). doi: 10.1088/1755-1315/1430/1/012005.
- Salam, S., Gursi, L., Nurcahyo, E., Suhartono, R. M., Suherman, L. O. A., Hezradian, F., & Hezraria, R. F. (2025). Preventing illegal sand mining through community-based environmental education in Buton's coastal ecosystem. In *BIO Web of Conferences* (Vol. 180, p. 02001). EDP Sciences. <https://doi.org/10.1051/bioconf/202518002001>
- Salim, Dafiuddin. 2012. "Pengelolaan Ekosistem Terumbu Karang Akibat Pemutihan (Bleaching) Dan Rusak." *Jurnal Kelautan* 5(2):142–55.
- Selviana, Maya, Ikhsan Rahim Syahputra, Alfi Mawaddah, Muhammad Rafly Fachri, and Sahri Ramadhan. 2024. "Tanggung Jawab Negara Dalam Pemenuhan Hak Atas Pendidikan Menurut Undang-Undang 1945." *Mediation : Journal of Law* 3:44–51. doi: 10.51178/mjol.v3i2.2004.
- Yaser el al., 2022. 2024. "Nusantara Nature Conservation Foundation's Efforts to Mitigate the Impact of Global Warming Through Mangrove Forest Conservation in Berau in 2018-2022." *Research Horizon* 0696:1–14.
- ZULIFLI ASPAN. 2015. "Hukum Terhadap P Perlindungan." *Hukum, Jurnal Vol, Lingkungan* 2(2):73–94.