International Journal Of Humanities Education And Social Sciences ***(IJHESS)*** *E-ISSN:* **2808-1765**
Volume 4, Number 2, October, *Page. 1011 – 1019*
Email : editorijhess@gmail.com

The Impact Of Sea Sand Mining On The Environment And Economy In Bawean Island

Maria Dewi Rosalina[1)], Irwan Triadi [2)], I Gede Sumertha Ky[3)], Pujo Widodo[4)], Achmed Sukendro[5)]
[1,2,3,4,5)]Peace and Conflict Resolution Study Program/Faculty of National Security, Indonesia Defens University, Indonesia

*Corresponding Author
Email: rosayoyok28.mdr@gmail.com; irwantriadi1@yahoo.com; gedesu16@yahoo.co.id; pujowidodo78@gmail.com; achmedsukendro@gmail.com

Abstract

This study analyzes the impact of sea sand mining on the environment and local economy in Bawean Island. Located in the Java Sea and part of Gresik Regency, East Java Province, Bawean Island is renowned for its biodiversity and natural beauty. Both legal and illegal sea sand mining have caused various problems, including increased coastal abrasion and erosion, degradation of seawater quality, damage to coral reef ecosystems and mangrove forests, and beach pollution. The economic impacts include a decline in fish catches, reduced tourism appeal, and social conflicts between pro-environment communities and mining parties. The research methodology used is qualitative descriptive, employing literature review for data collection. The findings indicate that sea sand mining results in serious ecosystem damage and adversely affects the economic well-being of local communities. To address these issues, recommended measures include reviewing local regulations, reassessing environmental permits, revoking non-compliant mining licenses, developing alternative economies, planting mangroves, promoting the benefits of mangroves, and adopting an interagency approach. This study emphasizes the importance of sustainable natural resource management and marine ecosystem protection to ensure the well-being of Bawean Island's communities.

Keywords: Sea Sand Mining, Bawean Island, Environmental Impact, Local Economy, Natural Resource Management.

INTRODUCTION

Bawean is an island located in the Java Sea and is part of Gresik Regency, East Java Province. Geographically, Bawean Island is situated between 112° 45' East Longitude and 05° 45' South Latitude. The island, which borders the Java Sea, has an area of approximately 196.27 km² with a diameter of 12 km (Pemprov Jatim, 2015). Bawean Island comprises two districts: Sangkapura District, with an area of 118.72 km², and Tambak District, with an area of 77.55 km². Sangkapura District consists of 17 villages, 11 of which are coastal villages in East Java Province, while Tambak District comprises 13 villages, 11 of which are also coastal villages in East Java Province (Sukandar et al., 2017). Bawean is inhabited by about 75,000 people whose livelihoods are mainly farming and fishing. Bawean is also known as the "island of daughters" because many of its youth migrate for work (Nur Liza, 2022). Bawean is a small island renowned for its biodiversity and natural beauty. The island has a rich marine ecosystem, including coral reefs, mangrove forests, and white sandy beaches. This natural beauty and biodiversity make Bawean Island not only an attractive tourist destination but also a primary source of livelihood for the local community, particularly fishermen and tourism industry players.

The marine and coastal ecosystems on Bawean Island play a vital role in maintaining environmental balance and providing various ecosystem services. Coastal ecosystems are interconnected, including human behavior and activities within them. For instance, mangrove ecosystems serve as spawning grounds for fish and shrimp and act as barriers against sedimentation for coral reef and seagrass bed ecosystems. Meanwhile, coral reef ecosystems are habitats for various fish species and other marine life essential to humans (Ramli Utina, et al.,

2018). Additionally, the white sandy beaches on Bawean Island attract tourists, significantly contributing to the local economy.

However, in recent years, sea sand mining activities on Bawean Island have become a concerning issue. Sand mining by PT. Putra Bangsa Gema Namaskasa, which started in 2020, has caused unrest among local fishermen, who believe that the mining activities will damage their fishing grounds and lead to coastal erosion affecting their settlements (PMII Bawean, 2020). In addition to legal mining, illegal sand mining is also conducted by local residents (Ade Irwansyah, 2022). Sand mining involves extracting sand, removing gravel, and discarding marine organisms, which are used as raw materials for concrete production, construction, and other purposes (Ayu Mukarromah & Thiya Mulyawati, 2023). The abundant availability of sand has led to increased mining activities. Sand mining operators often disregard regulations, causing numerous negative environmental impacts (Ashraf et al., 2011). While sand mining can have positive economic benefits, such as increased income and job creation, it also poses significant negative impacts on the environment and the local economy. These include environmental degradation, coastal erosion, and extreme tidal events (Hallatu et al., 2021). Despite its economic benefits, the negative impacts of sea sand mining on Bawean Island are considerable, necessitating sustainable natural resource management to protect the local ecosystem and community welfare.

The natural environment and its inhabitants are not created to be dominated by humans but to be utilized and preserved for the benefit of other creatures that need them. Understanding the environment can be gauged by several criteria, including awareness and concern for nature and the environment, comprehension of environmental issues, and critical thinking in solving environmental problems (Ramli Utina, et al., 2018). From an environmental perspective, sea sand mining can cause serious ecosystem damage. Coral reefs, one of the most productive ecosystems in the ocean, can suffer physical damage due to mining activities. Damage to coral reef structures and excessive sedimentation can block sunlight penetration, which is crucial for the photosynthesis of zooxanthellae algae living in the reefs. As a result, coral reefs can experience bleaching and death, reducing habitats for various fish species and other marine biota. Furthermore, the loss of coral reefs can diminish the marine ecosystem's ability to support biodiversity and fishery productivity.

The mangrove forests around Bawean Island are also vulnerable to the negative impacts of sea sand mining. Changes in current and wave patterns caused by mining activities can lead to soil erosion around mangrove roots, reducing the stability of the mangrove ecosystem and habitat for species dependent on this ecosystem. The loss of mangrove forests can also decrease coastal erosion protection capacity, carbon absorption ability, and disrupt the ecosystem's role in climate change mitigation. Additionally, Bawean's white sandy beaches serve as nesting sites for sea turtles, which are part of the coastal conservation area at the foot of Harun Tohir Airport. However, these beaches are eroding due to abrasion, threatening the existence of sea turtles, which are protected and nearly extinct (Ade Irwansyah, 2022).

The environmental impacts of sea sand mining also affect the local economy. The community of Bawean Island, which largely relies on the fishing and tourism sectors, may experience a decline in welfare due to marine ecosystem damage. Reduced fish catches due to habitat destruction and decreased water quality can directly affect fishermen's incomes. Moreover, damage to coral reefs and the decline in coastal environmental quality can reduce tourism appeal, decreasing tourist visits and reducing revenue from the tourism sector.

Based on the introduction of the problem, the research questions that can be formulated are as follows:

1. What are the environmental impacts of sea sand mining?
2. What are the economic impacts of sea sand mining?

3. What measures can be taken to mitigate environmental damage?

This research holds significant importance given the potential negative impacts of sea sand mining on the environment and the economy of the local community. The threat of ecosystem degradation poses significant risks that could disrupt the livelihoods of coastal communities in Bawean Island (Chofifah, 2023). The aim of this study is to identify and analyze the environmental and economic impacts of sea sand mining activities in Bawean Island. With a better understanding of these impacts, this research is expected to provide more effective policy recommendations for sustainable natural resource management, marine ecosystem protection, and the welfare of the community. The urgency of this study is further driven by the need for a more sustainable and equitable approach to natural resource management. Mismanagement that neglects environmental and economic impacts may lead to long-term losses, affecting not only ecosystems but also the community of Bawean Island (Chofifah, 2023). Therefore, this research aims to serve as a foundation for more prudent and sustainable decision-making, while also raising awareness of the importance of marine ecosystem protection and community welfare in Bawean Island. Moreover, this study seeks to contribute to the scientific literature on the environmental and economic impacts of sea sand mining in tropical regions, which often have highly vulnerable marine ecosystems. The case study of Bawean Island can offer valuable insights into how sea sand mining affects the environment and economy of small islands, serving as a reference for research and policy in other areas facing similar challenges.

RESEARCH METHODS

In this study, the method used by the author is descriptive qualitative. Given that descriptive qualitative methods are based on post-positivist philosophy, the researcher acts as the primary instrument in data collection (Moleong, 2018). The author collected data through literature review, thus the data used consists of notes from journals, articles, and books relevant to the research subject. In analyzing the data, Anggito & Setiawan (2018) mention four criteria that must be met: objectivity, relevance, conformity with developments, and representativeness. Therefore, in data analysis, the researcher follows the opinion of Miles & Huberman (1994) who propose three steps of data analysis: data reduction, data display, and conclusion drawing. This method is expected to yield discussions and conclusions that align with the issue being addressed, namely the land dispute conflict in Jatiasih District, Tangerang City, in 2023.

RESULT AND DISCUSSION

The activities of sea sand mining, carried out by both companies and the community, whether legally or illegally, have direct impacts on the environment and coastal communities. Significant economic effects are also evident, as fishermen face difficulties in obtaining marine yields due to these mining activities. This widespread exploitation does not always benefit the balance of the global ecosystem. Exploitation conducted without regard to environmental impacts is highly regrettable. Therefore, efforts need to be made to address the environmental damage resulting from sand mining activities on Bawean Island.

1. The Impact of Sea Sand Mining on the Environment

Sea sand mining has caused significant negative impacts on the coastal and marine environment of Bawean Island. One of these impacts is the increased abrasion and coastal erosion observed at Jherat Lanjheng Beach in Lebak Village, Sangkapura District, due to mining activities disrupting the natural distribution of sand along the shoreline (Sugiyono, 2024). Without adequate sand, the coastline becomes more vulnerable to wave and wind attacks,

resulting in the reduction of stable beach areas. This not only threatens coastal infrastructure but also habitats for various organisms. Furthermore, coastal abrasion damages cultural sites such as long tomb graves along the shoreline and affects religious tourist sites on Bawean Island (Sugiyono, 2024). Given that natural resources sustain human life, it is imperative to conserve them for the well-being of future generations (Ika Yanuar M & Irwan Triadi, 2024).

Figure I: The excavation of former sea sand mining sites has disrupted the environment.
Source: Bawean Net, 2021

In addition to coastal erosion and environmental damage, cultural and religious tourism sites, there is a decline in water quality due to waste and chemicals released during the sand mining process. This waste disrupts marine ecosystems, damages ecological balance, and threatens the survival of various marine organisms, including fish and other species. For instance, in Sumur-sumur Village, Sangkapura District, Pulau Bawean, coastal pollution has become a serious issue. Remnants of mining materials pollute the coastline, and coastal erosion results in sand being carried by seawater into pit excavations, causing losses to orchard owners near the beach area and making well water quality around the mining area murky (Media Bawean, 2021). Such pollution can harm the surrounding environment and disrupt the economic activities of coastal communities dependent on the sustainability of their coastal environment.

Another impact is the intensification of tidal floods on the coast, causing losses to the community and infrastructure on Bawean Island. Several hamlets in Kepuh Teluk Village, Pulau Bawean, have experienced tidal floods, affecting 50 houses with water levels reaching 5-12 centimeters. Furthermore, tidal floods have caused fishing boats parked along the coast to drift away, although they were not completely lost (Ashadi Iksan, 2022). Another consequence of sea sand mining is the destruction of coral reef ecosystems and the habitats of sea turtles living within them. This damage can lead to the loss of irreplaceable biodiversity and harm highly sensitive ecosystems.

2. The Impact of Sea Sand Mining on the Economy.

Sea sand mining has significantly impacted the coastal and marine environment of Pulau Bawean. One of the consequences is the disturbance and inadequacy of fish spawning grounds, crucial for fish reproduction. This has led to a decline in fish catches, particularly affecting small-scale coastal fishermen. Additionally, the majority of octopus fishermen are no longer able to sustain their production due to murky waters and high sea waves (Willy Abraham, 2020). These conditions threaten the sustainability of fisheries resources and disrupt the livelihoods of coastal fishing communities.

The degradation of marine ecosystems also affects the tourism sector. Tourism, which could potentially serve as an alternative source of income for Bawean communities, undergoes transformations. The deterioration of marine and coastal environments reduces tourist attraction, resulting in decreased visitor numbers and, consequently, reduced income from this sector. The loss of natural beauty and habitat degradation not only diminishes tourism appeal but also undermines the potential for sustainable ecotourism development.

Furthermore, sea sand mining exacerbates social conflicts between environmental advocates and sand miners, intensifying tensions and jeopardizing social peace in affected areas. For instance, protests led by the Indonesian Islamic Students Movement (PMII) in Bawean on Wednesday, September 16, 2020, voiced opposition against proposed sea sand mining activities in Bawean waters (Willy Abraham, 2020). Serious actions are required to address these negative impacts and ensure the sustainability of the marine environment for future generations.

Figure II. Community Rejection of Illegal Sand Mining
(Source: Pikiran Rakyat, 2022)

Subsequently, additional costs will need to be borne by the community or the government to address the problems arising from sand mining. Increased coastal erosion requires protection and restoration efforts, which entail significant expenses. Furthermore, damage to coastal infrastructure due to sand mining activities necessitates continuous repair and maintenance, ultimately burdening the regional budget.

3. Efforts to Address Environmental Damage

Uncontrolled marine sand mining has led to various negative impacts on the environment and the economy of coastal communities. To address this issue, effective alternative measures are required to regulate and limit such mining activities. The first step involves reviewing and assessing local regulations. The government, particularly at the local level, needs to periodically review and reassess regional regulations concerning marine and coastal spatial planning. This step should involve all relevant stakeholders, including the community, academics, and non-governmental organizations. This review aims to ensure that existing regulations remain relevant and effective in protecting the marine environment and supporting sustainable development.

The second step is the review of environmental and mining business permits. Issued Environmental Permits and Mining Business Permits need to be reassessed. Companies engaged in marine sand mining must comply with applicable local regulations. These adjustments are crucial to ensure that mining activities do not harm the environment and remain within established legal frameworks. If mining companies do not comply with legal frameworks, the revocation of Issued Environmental Permits and Mining Business Permits and law enforcement can be implemented. Illegal marine sand mining should be strictly addressed by creating binding legal regulations and imposing substantial fines. Strict law enforcement will provide a deterrent effect for illegal mining perpetrators and preserve the sustainability of natural resources.

The third step involves coordination with stakeholders and the development of alternative economic activities. Marine sand mining companies must coordinate with local stakeholders. They need to explore alternative economic development sectors that can enhance the welfare of coastal communities. Some alternatives to consider include crab cultivation, brackish water fishing, and giant prawn farming. Developing these sectors not only provides alternative income sources but also supports environmental sustainability.

The next step to be prepared is the mangrove planting program. Efforts to enhance mangrove tree planting programs need to be strengthened. Mangroves play a crucial role in maintaining coastal ecosystems, protecting shorelines from erosion, and providing habitats for various marine species. The mangrove planting program should be implemented systematically and involve active participation from the local community. Additionally, there needs to be outreach on the benefits of mangroves. The community should be educated about the benefits of mangrove forests in preserving coastal and marine ecosystems. This education is essential to ensure that the community understands the importance of mangrove conservation and actively participates in conservation efforts. With increased awareness of the benefits of mangroves, it is expected that the community will take a more active role in protecting the coastal environment.

Next, interagency coordination is required. An interagency approach involves various agencies with different responsibilities and expertise in addressing the impacts of marine sand mining on Bawean Island, thereby providing more comprehensive and effective solutions for reducing environmental damage and sustainably restoring the local economy. For monitoring and law enforcement, collaboration with the Environmental Agency (BLH) is needed to monitor the environmental impacts of mining and ensure the implementation of environmental protection regulations. The Marine and Water Police should tackle illegal mining activities and enforce mining permit regulations.

For research and monitoring, collaboration with the National Research and Innovation Agency is essential to conduct scientific research on the environmental impacts of mining and provide data-based recommendations. The Ministry of Marine Affairs and Fisheries should monitor the condition of waters and marine ecosystems and provide data for policy-making. For environmental management and restoration, cooperation with the Ministry of Environment and Forestry and Non-Governmental Organizations (NGOs) is necessary. To enhance the economy and education, collaboration with the Ministry of Tourism and Creative Economy and the Education Department is beneficial.

With these steps, it is expected that marine sand mining can be better managed, minimizing negative impacts on the environment and the economy of coastal communities. Cooperation between the government, companies, and the community is essential to achieve sustainable and environmentally conscious natural resource management. This comprehensive and sustainable approach will ensure that coastal ecosystems remain protected and that the economic well-being of the community can continue to improve without harming the environment.

CONCLUSION

Marine sand mining on Bawean Island, Gresik Regency, East Java Province, has caused significant negative impacts on the local environment and economy. This island, covering an area of 196.27 km², boasts a rich marine ecosystem, including coral reefs, mangrove forests, and white sandy beaches, which serve as the main sources of livelihood for fishermen and the tourism industry. However, both legal and illegal sand mining activities have led to severe coastal

abrasion and erosion. The disruption of natural sand distribution has made beaches vulnerable to waves and wind, threatening coastal infrastructure and marine habitats.

The decline in sea water quality is also a serious issue due to waste and chemicals from mining, which damage marine ecosystems and endanger marine organisms such as fish. Furthermore, coral reefs suffer physical damage and excessive sedimentation, hindering the photosynthesis of zooxanthellae algae, leading to coral bleaching and death. The surrounding mangrove forests are also at risk, with soil erosion around the mangrove roots reducing the stability of the ecosystem and the habitats of associated species. Coastal abrasion further threatens protected sea turtles.

These environmental impacts directly affect the local economy. Communities relying on fishing and tourism experience decreased well-being due to the destruction of marine ecosystems. The decline in fish catches and tourist appeal reduces the income of fishermen and tourism operators. Additionally, social conflicts between pro-environment communities and sand mining entities exacerbate the situation.

To manage marine sand mining sustainably, a review of local regulations concerning marine and coastal spatial planning, as well as environmental and mining business permits, is necessary. Local governments must ensure that existing regulations and permits remain relevant and effective in protecting the marine environment and supporting sustainable development. Mining companies should coordinate with local stakeholders to explore environmentally friendly economic alternatives, such as brackish water fisheries, giant prawn, and octopus farming.

Environmental conservation programs, such as community-participatory mangrove planting, need to be strengthened to maintain coastal ecosystems, protect shores from erosion, and provide habitats for marine biota. Strict law enforcement against illegal marine sand mining is also required to create a deterrent effect. An interagency approach, involving environmental agencies, marine and water police, research bodies, relevant ministries, and non-governmental organizations, is needed to provide comprehensive solutions for reducing environmental damage and sustainably restoring the local economy. With this approach, it is hoped that coastal ecosystems will remain protected, and the well-being of the community will improve without harming the environment.

REFERENCES

Abraham, Willy. (2020). Aktivis PMII dan Warga Tolak Penambangan Pasir Bawean, Berdampak Negatif, Ancam Aksi Besar-besaran. Retrieved June 19, 2024, from https://jatim.tribunnews.com/2020/09/19/aktivis-pmii-dan-warga-tolak-penambangan-pasir-bawean-berdampak-negatif-ancam-aksi-besar-besaran.

Abraham, Willy. (2020). Aktivis PMII dan Warga di Pulau Bawean Ancam Demo Jika Penambangan Pasir Dilakukan. Retrieved June 18, 2024, from https://surabaya.tribunnews.com/2020/09/19/aktivis-pmii-dan-warga-di-pulau-bawean-ancam-demo-jika-penambangan-pasir-dilakukan tanggal 18 Juni 2024.

Anggito, A., & Setiawan, J. (2018). *Metodologi Penelitian Kualitatif* (E. D. Lestari (Ed.)). CV. Jejak.

Ashraf, M.A., Maah, M.J., Yusoff, I., & Wajid, A. & Mahmood, K. (2011). Kekhawatiran Efek Penambangan Pasir : Studi Kasus Dari Bestari Jaya , Selangor , Semenanjung Malaysia. *Penelitian dan Esai Ilmiah*, 6(6), 1216–1231.

Bawean.net. (2021). *Aksi Penambangan Pasir di Sumur2 Meresahkan Warganya*. Retrieved June 12, 2024, from https://www.mediabawean.com/2021/01/aksi-penambangan-pasir-di-sumur2.htmll tanggal.

Chofifah, Q. N. (2023). Catatan Akhir Tahun : Melihat Ancaman Kerusakan Alam di Bawean Selama Tahun 2022, Retrieved September 30, 2024 from https://www.gresiksatu.com/catatan-akhir-tahun-melihat-ancaman-kerusakan-alam-di-bawean-selama-tahun-2022/

Cresswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*.

Hallatu, T. G. R., Wisadirana, D., Mu'adi, S., & Chawa, A. F. (2021). Illegal sand mining and sar local wisdom: a case study in Merauke. *International Journal of Social Sciences and Humanities*, 5(1), 45–56. https://doi.org/10.29332/ijssh.v5n1.827

Iksan, Ashadi. (2022). Banjir Rob Terjang Pulau Bawean, 50 Rumah Tergenang Perahu Nelayan Hanyut. Retrieved June 19, 2024, from https://jatim.inews.id/berita/banjir-rob-terjang-pulau-bawean-50-rumah-tergenang-perahu-nelayan-hanyut.

Irwansyah, Ade. (2022). *Tolak Aktivitas Tambang Pasir Ilegal, Masyarakat Adat Bawean Pasang Spanduk, Pikiran Rakyat media network*. Retrieved June 06, 2024, from http://gresiktoday.pikiran-rakyat.com/seputar-gresik/pr-2453772096/tolak-aktivitas-tambang-pasir-ilegal-masyarakat-adat-bawean-pasang-spanduk?page=all

Irwansyah, Ade. (2022). *Tambang Pasir Liar Pulau Bawean Gresik, Ancam Habitat Penyu Bawean: Ayo Jaga Lingkungan...!!!. Pikiran Rakyat Media network.* Retrieved June 07, 2024, from https://gresiktoday.pikiran-rakyat.com/seputar-gresik/pr-2453816896/tambang-pasir-liar-pulau-bawean-gresik-ancam-habitat-penyu-bawean-ayo-jaga-lingkungan?page=all

Irwansyah, Ade. (2022). *Tolak Aktivitas Tambang Pasir Ilegal, Masyarakat Adat Bawean Pasang Spanduk.* Retrieved June 12, 2024, from https://gresiktoday.pikiran-rakyat.com/seputar-gresik/pr-2453772096/tolak-aktivitas-tambang-pasir-ilegal-masyarakat-adat-bawean-pasang-spanduk?page=all tanggal.

Liza. Nur. (2022). *Asal Usul Pulau Bawean*. Retrieved June 02, 2024, from http://www.uinsaid.ac.id/id/asal-usul-pulau-bawean#:~:text=Bawean%20dihuni%20sekitar%2075%20ribu,dan%20masyarakatnya%20yang%20sering%20merantau

Margiyanti, I.Y., & Triadi, I., (2024). Peran Hukum Lingkungan Dalam Upaya Menjaga Sumberdaya Alam Demi Keberlangsungan Hidup Manusia. *Jurnal Hukum dan Sosial Politik*. Vol.2, No.3, 179-187.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook.* Sage.

Moleong, L. J. (2018). Metodologi Penelitia Kualitatif (38th ed.). PT. Remaja Rosdakarya

Mukarromah, Ayu & Mulyawati, Thiya. (2023). Demokrasi Lingkungan Hidup Masyarakat Pulau Kodingareng: Konflik Penambangan Pasir Laut dan Masyarakat Nelayan di Sulawesi Selatan. *International Jurnal Of Demos.* Vol. 5, 2, 263-278.

Pemerintah Provinsi Jawa Timur (Pemprov Jatim). 2015. Laporan penyelenggara Pemerintah Daerah Provinsi Jawa Timur. Surabaya.

PMII Bawean. (2020). *Tolak Tambang Pasir Laut di Perairan Pulau Bawean. Petisionline.com.* Retrieved June 10, 2024, from http://www.petisionline.com/tolak_tambang_pasir_laut_diperairan_pulau_bawean

Sugiono. (2024). Abrasi dan Gempa Bumi Merusak Area Makam Panjang di Pantai Jherat Lanjheng Pulau Bawean, Gresik Retrieved June 09, 2024, from

https://suryamalang.tribunnews.com/2024/05/14/abrasi-dan-gempa-bumi-merusak-area-makam-panjang-di-pantai-jherat-lanjheng-pulau-bawean-gresik.

Sukandar, M. Handayani, C.S.U. Dewi, C. J. Harsindhi, A. W. Maulana, Supriyadi, A. Bahroni. 2017. Profil desa pesisir Provinsi Jawa Timur: Volume 1 (utara Jawa Timur). Bidang Kelautan, Pesisir Dan Pengawasan. Dinas kelautan dan perikanan Provinsi Jawa Timur, Surabaya.

Utina, Ramli., Nusantari, Elya., Katili, A. Sidik., Tamu, Yowan. (2018). Ekosisitem Dan Sumber Daya Alam Pesisir Penerapan Pendidikan Karakter Konservasi. *Penerbit Deepublish (Group Penerbitan CV Budi Utama)*. Yogyakarta.