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# Empowering Coastal Communities: How Environmental Literacy Shapes a Sustainable Future

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## ABSTRACT

This study aims to explore the concept of sustainable awareness in coastal communities. The author examines the relationship between environmental literacy and sustainability awareness in the lives of coastal residents. Using a literature review method, this paper investigates ecological literacy's role in building sustainability awareness in coastal communities. It has been discussed and analyzed in the broader context of the growing literature on environmental literacy and sustainable development in coastal communities.

**Keywords:** Coastal communities; Coastal area; Environmental literacy; Sustainability awareness.

## 1. INTRODUCTION

Environmental changes due to large-scale impacts such as climate change and biodiversity loss pose a significant challenge to the sustainable development of societies worldwide (Armijo *et al.* 2003; Robertson, 2012). In this regard, environmental degradation is a frequently discussed issue by governments, researchers, and local and international organizations (Carapuço *et al*. 2022; Tilbury, 2004). Since the 1970s, following the UN conference on the environment in Stockholm, it has attracted the attention of many countries worldwide. Global warming, ozone layer depletion, the greenhouse effect, and acid rain are some of the environmental issues of international concern (Md *et al*. 2024; Notter *et al*. 2013). To ensure human survival, these issues must be taken seriously. Scientifically, technologically, and environmentally literate human resources are driven by environmental issues and advances in science and technology. The speed of technological advancement in various fields has an impact on the environment, both positive and negative (Doup, 2018; Wang *et al.* 2018). To maintain our environment's and planet's sustainability, two interrelated concepts are science and technology and environmental literacy.

Indonesia is one of the countries affected by global warming (Adityosulindro and Wulandari, 2021; Humaira and Rahmah, 2024; Mukimin and Vistanty, 2023). This has an impact on the weather and changes in temperature and affects skin health. With the effects of global warming, people are becoming more environmentally conscious. Furthermore, coastal communities depend highly on natural resources, especially the sea and surrounding ecosystems (Dantzler *et al.* 2008; Scott and Sheffield, 2021). However, pressure on the environment due to overexploitation of resources, pollution, and climate change pose a serious threat to the sustainability of their lives. One of the factors contributing to this problem is the low level of environmental literacy in coastal communities. Environmental literacy refers to the understanding, attitudes and behaviors that support ecological sustainability and awareness of the impact of human activities on ecosystems (Beyer *et al*. 2015; Malcom, 2013).

Improving environmental literacy is essential to deal with the sustainable development challenges coastal communities face. In coastal communities, improving environmental literacy is vital to building sustainable awareness (Darmastuti *et al.* 2023; Koenigstein *et al.* 2020; Kumar, 2023). With a better understanding of marine ecology, conservation and the negative impacts of human activities on the environment, communities are expected to manage natural resources more wisely. Given the importance of environmental literacy skills, every individual on this earth is an individual who already understands the importance of caring for the environment, ecosystems and everything on earth (Chase and Levine, 2016; Somerville, 2011). Based on this ability, individuals should be able to be wise in managing their mindset and behavior in harmony with the pattern of the surrounding environment. Literacy awareness

must be based on self-awareness, the environment and the government. Literacy is very important for the community environment because it is a literate environment, which will foster community awareness and help them understand and know the condition of their environment. The link of environmental literacy to broader sustainability challenges in coastal communities should be made by highlighting how an informed and educated community is better equipped to understand and manage these complex issues, fostering resilience and sustainable practices that contribute to both environmental protection and social well-being. Therefore, this paper tries to start by recognizing the concept of environmental literacy in coastal communities and exploring how it has implications for sustainable awareness (Nam and Ito, 2011).

Furthermore, this paper tries to explore the concept of sustainable awareness in coastal communities. Then, the author attempts to relate the concepts of environmental literacy and sustainability awareness in coastal communities

## 2. METHODOLOGY

This research uses the library method. This library research is carried out by collecting various reading references relevant to the problem under study, and then understanding is carried out carefully to obtain research findings. In analyzing the data, the author uses the method of content analysis, namely, the data obtained and then compiled so as to facilitate the discussion of existing problems (Long *et al*. 2014).

## 3. UNDERSTANDING ENVIRONMENTAL LITERACY IN COASTAL COMMUNITIES

Understanding environmental literacy is not always easy. Environmental literacy can be defined as the ability to understand and interpret the relative health of ecological systems and take appropriate actions to maintain, restore or improve the health of those systems (Ibrahim *et al.* 2024). The components of environmental literacy consist of cognitive, affective, and behavioral dimensions (Andrea and Petkou, 2022; Elder, 2009). The cognitive component assumes an understanding of basic ecological concepts and local and global environmental systems, while the affective component deals with attitudes and values regarding the environment. The behavioral component concentrates on the actions extrapolated by individuals to protect and enhance their environment (Huang *et al*. 2022).

The relationship between these three components is critical. Awareness of the surrounding environment rests on these interconnected dimensions, forming environmental literacy together (Tasneem and Ahsan, 2024). Individuals need to understand the impacts of their actions on nature and society to generate a framework for interpreting those impacts and thus shape their behavioral responses. Therefore, knowledge can generate behavior change, and awareness transmits behavioral responses. Change must be triggered by all three interrelated dimensions of consciousness (knowledge, attitude, and action) for change to be effective and permanent. This model tends to see literacy as pluralistic, which recognizes different forms of awareness interrelated with contextual and cultural variables. It assumes that understanding is based on continuous interpretation of the environment mediated by knowledge, feelings and actions bound by beliefs, customs or traditions of territorial management (Akhbari *et al.* 2024; Ibrahim *et al*. 2024; Ruiz, 2001).

Coastal communities worldwide face various environmental issues that place them in a vulnerable community context (Richter *et al*. 2022). Translating the right level of environmental literacy into specific knowledge, skill acquisition and types of awareness regarding local ecological resources can be a key factor in local communities being able to find appropriate strategies to deal with the impacts of climate change, overfishing and pollution, and being able to develop effective resilience using sustainable solutions and practices. Part of this may involve avoiding harmful direct impacts on local ecosystems and reducing vulnerability to harmful external pressures. By understanding this, community empowerment can be the beginning of forming a new type of social contract that aims to improve human actions towards the environment. Given these assumptions, environmental literacy based on specialized knowledge of biological resources as a whole the specific biological resources that make up local ecosystems and the interactions that local communities have with these biological resources can play an essential role in devising, implementing and evaluating effective and sustainable management policies aimed at protecting and conserving these biological resources and for developing cultural knowledge that can be passed on to future generations (Buchcic and Grodzińska, 2004; Rodgers *et al*. 2024).

Global changes reflect a wide variety of interrelated issues that impact coastal communities, placing them in a highly uncertain situation concerning the future (Tan *et al*. 2023). The development and implementation of educational initiatives to improve environmental literacy can be the foundation for a system that aims for sustainable development for coastal communities and supports their overall well-being. This is even true if we remember that today, a significant challenge for ocean and coastal management is to find dynamic solutions that allow us to consider the different and often conflicting interests that arise among various stakeholders, which usually move from interests that are not based solely on economics. Environmental literacy strategies allow people to take advantage of a structured framework that can critically assess the prevailing

situation that separates the wheat from the chaff and replaces planning-based approaches and stakeholder welfare approaches with what has often been a political fait accompli and clientelistic approach that has proven repeatedly to be socially and economically unproductive and almost always ecologically unhealthy. However, it is essential to remember that any educational effort must realistically address critical environmental issues pertinent to the local context.

## 4. THE CONCEPT OF SUSTAINABLE AWARENESS IN COASTAL COMMUNITIES

Focus on building resilient coastal communities aware of the importance of understanding and actively trying to maintain the balance of ecological systems for future generations. This is what sustainability awareness means. Coastal communities are unique compared to other human settlements because they draw their resources directly from the sea. Over the years, humans living in these environments have learned ways to utilize the ocean for food, industry and recreation. The search for solutions that will lead to more sustainable coastal communities emphasizes the need for changes in the daily lives of these communities towards a more resource-conservative path. This is a sustainable lifestyle. Coastal awareness and lifestyle should be seen not as separate issues but as interrelated and interdependent ways of thinking and acting (Deng *et al.* 2025; Tran *et al*. 2025; Wijayanti *et al*. 2024; Wu *et al*. 2025).

To affect change within communities towards resource sustainability, community members must understand the ecological strategies involved. Lifestyle changes must be based on an awareness of individual coastal activities and how they impact the surrounding marine environment (Fru and Ndaba, 2023; Ibáñez *et al*. 2024). This is sustainability awareness. Often, seemingly practical human actions do not consider the potential long-term and far-reaching environmental impacts. Ostensibly influenced by the ocean, human behavior, especially in heavy industry, often seems infinite and enormous, but the benefits offered by the sea are quickly depleted. It is proposed that human activities on the coast should take a more balanced approach where actions taken, in addition to meeting immediate needs, are accompanied by actions that ensure the sustainability of marine ecosystem resources.

Sustainable awareness is the harmonization between environmental literacy, community readiness and education. Environmental literacy requires knowledge about ecological sustainability, resources, waste, wildlife, and the best options for utilization and conservation (Spence *et al*. 2014). Community readiness requires good cooperation between the community and the government to remain ready to face changes and overcome them for a better future. Meanwhile, in this case, educational needs provide good education and training related to all environmental care needs so that people can make preventive efforts to save nature when disaster approaches.

Coastal areas, typically rich in biodiversity, face pressure for exploration and settlement growth (Ameri *et al*. 2024; Smith, 2016). Common coastal degradation problems include erosion, sedimentation, flooding and oil pollution. It has been proven that coastal awareness is a key element when discussing sustainable coastal management. From a broader perspective, higher public awareness of the immediate and long-term causes of degradation in a community will help address and prepare the community better for change. Public awareness is insufficient (Cinar *et al.* 2024; Irawan *et al.* 2023). There is a need to build an education system that can articulate this harmonization. Environmental literacy must be mentally equipped for coastal communities in both broad and deep orientations; the government must be able to socialize, empower and actualize this literacy at all levels of society and build the best education system to sustain it (Chen *et al.* 2024; Husna *et al.* 2024; Pazoto *et al*. 2021; Venkataramaiah *et al.* 2013). The basic sustainable awareness models each show four important parameters to support environmental awareness, each with several elements that can be measured.

Sustainable awareness technically equates to promoting awareness and adoption of sustainable practices regarding resources and habitats among local coastal communities (Graziani *et al.* 2013). As a broader and vital driver for their well-being, this is a significant concern in today's environment, especially with habitat types bearing countless burdens in terms of services provided beyond any carrying capacity. While there is an increase in information packages presented both internationally and nationally in thematic areas of both coastal and marine environments, a significant gap is seen between the technical aspects and the possibilities of local stakeholders - including poor resources in technology, economics or education. The gap can be much more significant in many tropical and subtropical regions due to the minimal ability to understand such technological and abstract phenomena. Overcoming such gaps requires an interconnected regeneration of the entire technology synchronization, i.e., between satellites, human engagement, informatics, and government policies (Cherian and Natarajamurthy, 2024; Kurniadi *et al.*, 2025; Oliveira *et al.*, 2024). This involves not only physical input but also abstract concepts of the mind. Being in a different realism, such knowledge is closer to sympathy, settlement, and the secret relationship created between humans and habitats.

## 5. THE RELATIONSHIP BETWEEN ENVIRONMENTAL LITERACY AND SUSTAINABILITY AWARENESS

Environmental literacy and sustainability awareness are widespread and frequently adopted terms in current perceptions of sustainability. Ecological literacy has been outlined as the potential, knowledge, aptitude, appreciation, and desire necessary to consider deriving important conclusions about nature and to derive the required actions to protect it (Fauzi *et al.* 2023). Minimal environmental literacy can be adopted in various forms, but it is understood overall as a tool to support the conclusions more often associated with sustainability in coastal communities. For example, a degree of ecological literacy makes individuals better equipped to recognize how lianas can support coastal indigenous people and agriculture better than forests near rivers (Ke *et al*. 2022; Strand *et al*. 2023).

Over time, communication with communities, law enforcement agencies, or expert agencies may result in more contact regarding best practices, conservation measures, or approaches to managing damage. This would be a phase of progress in sustainability awareness. Involvement in coastal issues can make individuals more environmentally literate, so it is necessary to distinguish between proactive classroom or expository ecological literacy acquired earlier than an event, and field environmental literacy acquired through causal experience or applying literacy to appreciate an understanding better. In addition, coastal communities' understanding enables them to appreciate pressures and derive available actions to address them (Elida *et al*. 2025; Nurlukman *et al.* 2024; Segaran *et al.* 2023; Sendurpandian *et al.* 2024). This understanding implies a good foundation of environmental literacy so that these efforts can enhance sustainable awareness in a communicative environment. Cases of coastal communities around the world have recognized or decided on local laws against invasive plants after being environmentally literate about the damage they created or presenting them to experts who testified and promised to solve the problem (Kardel *et al*. 2023; Zamora *et al.* 2024). This shows that environmentally literate communities can raise sustainability awareness, mainly if armed with the language of literacy, to engage in dialog efficiently.

## 6. CONCLUSION

Environmental awareness and education are increasingly seen as a precursor to building broad public consensus on the importance of ecological issues as well as the potential role of individuals in promoting sustainable development. In coastal communities, this notion is gaining increasing attention, particularly in the context of mitigating various impacts on marine biodiversity and ecosystems while fostering resilience to climate change. This paper seeks to investigate the role of environmental literacy in building sustainability awareness in coastal communities. Literacy is a key mechanism in promoting sustainability awareness because it enables people to understand the issues, access information, engage in informed discussions, and take action to contribute to a sustainable future. The mechanisms through which literacy foster sustainability awareness are multifaceted, incorporating the ability to access and interpret information, think critically, participate in decision-making, understand global interconnections, and engage with practical sustainability efforts. Literacy, in all its forms, serves as the foundation for fostering an informed, active, and engaged coastal communities that can contribute meaningfully to the pursuit of sustainability goals.

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## CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.



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