

SDGs 12 Needs Coastal Sustainability: Impact of Sand Mining Activities on Environmental Conditions in Kodingareng Lompo Island, Indonesia

Ketriyanti Agus^{1*}, Agussalim Burhanuddin², Seniwati³
¹⁻³ Universitas Hasanuddin, Indonesia

Address: Jl. Perintis Kemerdekaan Km.10 Tamalanrea, Makassar Sulawesi Selatan Indonesia

Email correspondence: seniwati@unhas.ac.id

Abstract. Sand mining in coastal regions, particularly on Kodingareng Lompo Island, has emerged as an environmental concern that profoundly affects ecosystem sustainability and the livelihoods of local populations. This study aims to analyze the impact of sand mining activities on coastal ecological conditions and their relationship to Sustainable Development Goal (SDG) 12 on sustainable consumption and production. A qualitative approach will be adopted, using interviews with local stakeholders such as fishermen, women entrepreneurs, the Neighborhood Association, and the Neighborhood Unit. Sand mining causes coastal erosion, habitat destruction, and water quality degradation. As a result, fishermen's catches and the economic incomes of local communities decline dramatically. This practice accelerates environmental damage contrary to the SDGs and exacerbates damage contrary to the principles of SDG 12. Recommendations for stricter regulations and implementing environmentally friendly mining methods can reduce adverse environmental impacts and support the sustainability of coastal ecosystems and the well-being of local communities. Such policies are essential to balance natural resource utilization and conservation efforts, aligning with SDG target 12. The novelty of this study lies in the need for more literature discussing this issue in Kodingareng Lompo Island.

Keywords: Mining, Sand, Ecosystems, Sustainability

Abstrak. Penambangan pasir di wilayah pesisir, khususnya di Pulau Kodingareng Lompo, telah muncul sebagai masalah lingkungan yang sangat memengaruhi keberlanjutan ekosistem dan mata pencaharian penduduk setempat. Penelitian ini bertujuan untuk menganalisis dampak kegiatan penambangan pasir terhadap kondisi ekologi pesisir dan hubungannya dengan Tujuan Pembangunan Berkelanjutan (SDG) 12 tentang konsumsi dan produksi berkelanjutan. Pendekatan kualitatif akan diadopsi, menggunakan wawancara dengan para pemangku kepentingan lokal seperti nelayan, pengusaha wanita, Rukun Warga, dan Rukun Tetangga. Penambangan pasir menyebabkan erosi pantai, kerusakan habitat, dan penurunan kualitas air. Akibatnya, hasil tangkapan nelayan dan pendapatan ekonomi masyarakat setempat menurun drastis. Praktik ini mempercepat kerusakan lingkungan yang bertentangan dengan SDG dan memperburuk kerusakan yang bertentangan dengan indikator-indikator SDG 12. Rekomendasi untuk peraturan yang lebih ketat dan menerapkan metode penambangan yang ramah lingkungan dapat mengurangi dampak lingkungan yang merugikan dan mendukung keberlanjutan ekosistem pesisir dan kesejahteraan masyarakat setempat. Kebijakan tersebut penting untuk menyeimbangkan pemanfaatan sumber daya alam dan upaya konservasi, sejalan dengan target SDG 12. Kebaruan penelitian ini adalah lebih banyak literatur yang membahas masalah ini di Pulau Kodingareng Lompo.

Kata kunci: Penambangan, Pasir, Ekosistem, Keberlanjutan

1. INTRODUCTION

Coastal sand mining involves the physical removal of sediment from the seabed to a designated location, starting with dredging and followed by the transportation and collection of materials at various sites. This process disrupts the seabed structure, potentially damaging existing marine habitats. Dredging activities often lead to increased turbidity, which blocks light from reaching the seabed and affects the photosynthesis of organisms like coral reefs (Wahyudi et al., 2023, p. 74). Sand mining activities disrupt marine ecosystems, potentially reducing the populations of marine life.

Decreased light penetration and oxygen levels in water bodies due to sedimentation and turbidity can have cascading effects on aquatic ecosystems. Decreased oxygen levels lead to hypoxia or even anoxia, creating dead zones where aquatic life cannot survive. This can result in mass fish kills and decreased biodiversity. In addition, sand mining operations often involve the use of heavy machinery and chemicals to extract and treat sand. Heavy equipment such as dredges and excavators disturb the riverbed or shoreline, releasing sediment into the water and causing additional turbidity. Chemicals such as flocculants can be used to settle suspended particles, but can introduce contaminants into the environment. These contaminants may include heavy metals from equipment corrosion and hydrocarbons from fuel spills or leaks. The introduction of contaminants into water bodies poses risks to human health and ecosystem integrity. Heavy metals such as lead, mercury, and arsenic can accumulate in aquatic organisms and bio magnify through the food chain, potentially reaching dangerous levels for human consumption. Hydrocarbons can have toxic effects on aquatic life, disrupting growth, reproduction, and immune function. In summary, the discharge of sediment- and pollutant-laden water from sand mining operations can have significant environmental impacts on rivers, lakes and coastal ecosystems. These impacts include reduced water quality, habitat degradation, loss of biodiversity, and risks to human health. Therefore, sustainable management practices and regulatory measures are essential to mitigate these adverse effects and ensure the long-term health and integrity of aquatic environments (Poonia et al., 2024, p. 313). There is a need to understand that sand mining has an impact on the ecosystem that can damage the underwater wealth that characterises a coastal or island area.

Tourism requires ecological capital as a key ingredient for creating tourism experiences (Baloch et al., 2023, p. 5927). This ecological capital is in the form of natural use-values on which Tourism Production depends. These natural use values can be in the form of natural resources, ecological features, geographical features and social conditions (cultural and historical sites)(Liodakis, 2023, p. 410). The existence of this ecological capital is not only an attraction for tourists, but also plays an important role in determining the quality and sustainability of the tourism experience. Diverse natural resources and unique geographical features provide a sense of place. On the other hand, culture and history provide additional knowledge that enriches the experience.

Tourism is a dynamic force that encourages travellers to explore nature, adventure, wonder and society, discover new cultures, meet new people, interact with different values

and experience new traditions and events. Tourism development attracts travellers to specific destinations to develop and sustain the tourism industry. In addition, environmental sustainability is a conscious, future-focused effort to preserve socio-cultural heritage and protect natural resources to maintain environmental ecosystems through supporting the health and economic well-being of communities. Environmental sustainability can be reflected in clean and green natural landscapes, thriving biodiversity, pristine beaches, vast expanses of desert, as well as socio-cultural values and archaeological heritage that reflect the level of tourist motivation and the willingness of local communities to welcome visitors. In this regard, tourism growth and environmental sustainability are considered as interdependent constructs. Therefore, increased tourism development and tourist arrivals directly affect the quality of sustainable and green tourism (Baloch et al., 2023, p. 5918). One of the elements in tourism development is the preservation of the environment. Therefore, tourism growth and environmental sustainability are mutually supportive.

Unsustainable growth can create negative outcomes for communities, countries and globally, which is why the UN has launched the Sustainable Development Goals (SDGs) framework. The UN emphasises that all member states should strive to achieve the SDGs and save natural resources and the environment for future generations. The SDGs 2015 to 2030 were planned by the UN as a new and extended set of Millennium Development Goals (MDGs) that took place from 2000 to 2015. The 17 SDGs relate to almost every area of life on land or underwater, however, each SDG provides a different direction, namely: Goal 1 focuses on poverty reduction, Goal 2 focuses on hunger, Goal 3 focuses on good health, Goal 4 focuses on quality education, Goal 5 focuses on gender equality or equal rights for men and women. Clean water and sanitation are an important part of the environment and are critical to health, and these issues fall under Goal 6. Goal 7 relates to energy resources, particularly affordable and clean energy. The growth of economic assets required for each country is listed as Goal 8. Goal 12 is related to responsible consumption and production, Goal 10 to reduce inequality i.e., equality for all human beings, and Goal 11 focuses on sustainable cities and communities. Goal 13 highlights climate action focused on a clean climate without pollution, Goal 14 concerns life underwater, and Goal 15 centres on life on land that is healthy and safe for all people and species. Goal 16 emphasises peace, justice and strong institutions, and Goal 17 highlights the need for partnerships to achieve the goals (Khizar et al., 2023, p. 2). These 17 goals have tasks in sustainable development that work in their respective goals but the author will focus on SDGs 12 because this research relates to sand mining which is included in the Goal Consumption and Production.

The discourse on Sustainable Consumption and Production (SCP) Patterns has been part of UN discussions on the environment and sustainable development since the UN Conference on the Human Environment in 1972 in Stockholm (Gasper et al., 2019, p. 83). In this sand mining activity, it is included in goal 12 which relates to consumption and production patterns.

2. METHODS

The methods used in this research are qualitative methods in the form of interviews and library research. The interviews involved informants consisting of Government, neighbourhood associations, neighbourhood unit, fishermen, and Women Entrepreneurs. The following table presents the number of informants who participated in the interviews.

Tabel 1. List of Respondent

No	Position	Background Education	Amount of People
1	Government	Senior High School	1
2	Neighborhood Association (RW/ Rukun Warga) 1	Senior High School	1
3	Neighborhood Association (RW/ Rukun Warga) 2	Elementary School	1
4	Neighborhood Unit (RT/ Rukun Tetangga) 1	Senior High School	1
5	Fisherman	Elementary School	1
6	Women Entrepreneurs	Elementary School	2
7	Woman Entrepreneur at the Coastline	Junior High School	1

Source: Self Analyzed Data

The following is a list of interview questions regarding sand mining activities.

- a. What are the impacts of sand mining on the neighbourhood and coastal environment?
- b. Have there been any changes in community incomes since the mine started operating?
- c. Are there any government efforts to address the problems caused by the mining?
- d. What is the community's resistance to this mining activity?
- e. How many people live on Kodingareng Island?

The location of this research is Kodingareng Lompo Island in Sangkarrang Sub-district, which is 12 km from Makassar City. The journey to Kodingareng Island takes one hour using a passenger boat. Geographically, Kodingareng Island is located at coordinates 119°16'00" BT dan 05°08'54" LS (Chandra, 2021). Kodingareng Lompo Island is relatively close to Makassar City, making it a strategic location for the development of various economic and tourism activities.

Kodingareng Lompo Island has a mostly flat topography. The island extends from north to south with the southern part having a plain that extends into the sea in the form of a spit or protrusion of sand sticking out of the sea (Idrus et al., 2023, p. 35). Kodingareng Island has a total area of 48 hectares and the mainland of this island has an altitude of <500 metres from sea level (BPS, 2021). The strategic location of the island allows the development of nature tourism activities that focus on natural beauty, especially the sand flats that form spits, adding to its unique character.

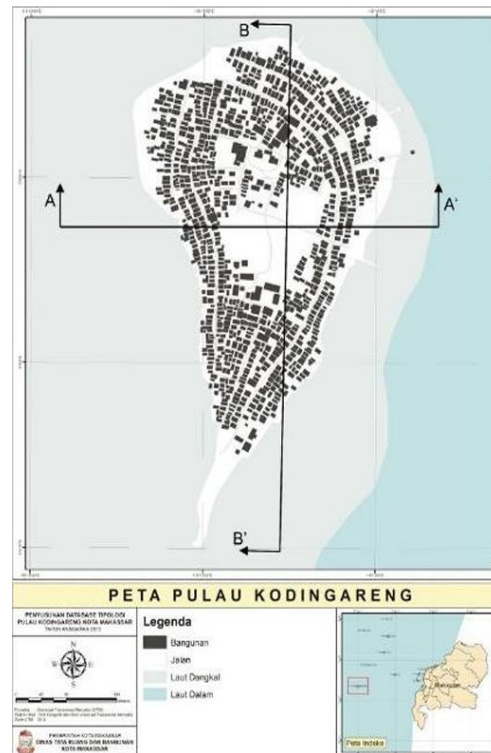


Figure 1. Map of Kodingareng Island

Source: https://digilibadmin.unismuh.ac.id/upload/38621-Full_Text.pdf

Kodingareng Island is one of the outer islands of Makassar City. The level of density on Kodingareng Island means that there is no displacement of people, so land use for residential development is uncontrolled. In addition, the erosion of the Kodingareng Lompo Island plain has caused the island's plain to become very narrow, affecting the land area that can be utilised by residents (Idrus et al., 2023, p. 35). Suboptimal land management and high settlement density have the potential to cause environmental problems such as increased risk of flooding or other disasters.

Population of Kodingareng Lompo Island

The population of Kodingareng Lompo Island reflects life on a small, crowded island with a constantly changing population. The following graph of the population on Kodingareng Island illustrates the population growth from 2019 to 2023.

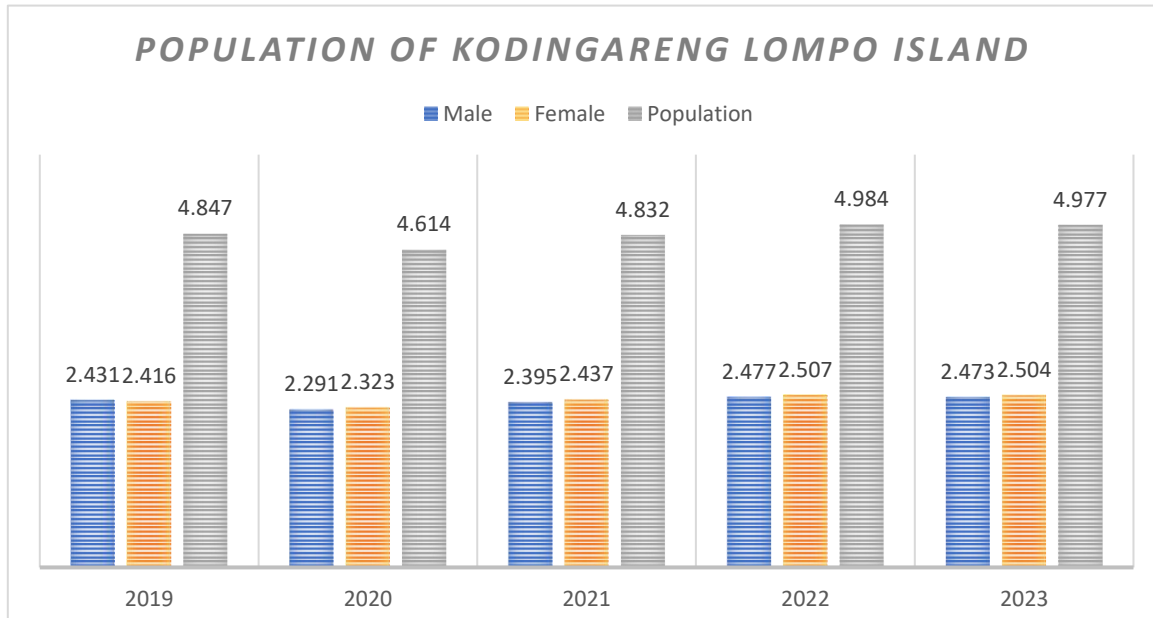


Figure 2. Population of Kodingareng Lompo Island

Source: (BPS, 2020, 2021, 2022, 2023, 2024)

Kodingareng Island has experienced changes in population over the past four years. In 2019, the total population was recorded at 4,847 people with a male population of 2,431 people while women numbered slightly lower, namely 2,416 people. In 2020, there was a decrease in the population of both males and females with a total of 4,614 people, where males totalled 2,291 people and females 2,323 people. However, there was an increase in 2021 with a total population of 4,832 people consisting of 2,395 men and 2,437 women. This increase continued until 2022 with a total population of 4,984 people, consisting of 2,477 men and 2,507 women. However, in 2023 there was a decrease in population with a total population of 4,977 people consisting of 2,473 men and 2,504 women (BPS, 2020, 2021b, 2022, 2023, 2024). Although the population fluctuates, overall there has been an increase in the number of women over men in the last five years. A staff member of the Kodingareng village said that the population of the area will be approximately 5,000 people by 2023 (interview, Kodingareng Lompo Island, September 28, 2024). From this interview we can get information about the population of Kodingareng Island, which is far from the centre of Makassar.

3. LITERATUR REVIEW

Environmental Security

The concept of Environmental Security was first introduced in the mid-1970s when a report for the Organisation of African Unity on the Ogaden War between Ethiopia and Somalia was written. The concept was first used by UNDP in 1994, including major threats that could upset the fragile balance on the ground. The UNDP report identified: Seven different areas of human security, environmental security often in the form of the consequences of environmental disasters is one of them. Here it is clear that the security equation does not include military-related issues, but rather situations that are difficult and equivalent to war. Environmental security emerged as a concept and at the same time as a result of a series of policies at the end of the Cold War. Environmental security quickly became one of the most popular issues in this new period of security studies. Although currently sidelined by the war on terror, the potential link between global warming and security is giving new impetus to the environmental security debate. In an environment where environmental safety is at issue, it is imperative that the realisation of environmental protection is carried out through the need to ensure environmental safety (Ibraj et al., 2024). Facing an environmental crisis, security should no longer focus on military aspects, but should include the protection of vulnerable natural resources and ecosystems. Environmental degradation can ultimately lead to social instability, conflict and threats.

Environmental security has become a central theme of international politics because of its importance and role in the standard and quality of human life, but also because of the increasing conflicts it generates. Environmental security has become part of the national and international agenda (Ibraj et al., 2024). The impact of environmental degradation is far-reaching on social and economic stability, as well as the potential for conflict due to competition for resources. Threats such as climate change, pollution and habitat destruction not only damage ecosystems but will also threaten people's livelihoods.

The United Nations Millennium Project of 2002 defines environmental security as the relative safety of society from environmental hazards caused by natural or human processes due to ignorance, accident, mismanagement, or design and originating within or across national borders (Ahluwalia, 2020). Environmental dangers sometimes originate from humans and environmental safety will also start from the community.

According to UNEP, the ocean covers three-quarters of the Earth's surface, contains 97 per cent of the Earth's water, and represents 99 per cent of the planet's living space by volume. Water is the lifeline of all living things, plants, marine life and biodiversity. The

causes of water degradation and pollution are: industrial waste, sewage and wastewater, mining activities, dumping of waste into the ocean, accidental oil leaks, burning of fossil fuels, chemical fertilisers and pesticides, global warming and greenhouse gas emissions, radioactive waste, leaks from landfills, etc. As its degradation has a direct impact on population, urbanisation, marine life, hospitality and tourism industries, industrialisation and biodiversity, it is a major source of socio-economic security concerns (Ahluwalia, 2020). As a result of the ever-increasing degradation, this issue is of serious concern because it can trigger economic problems and even disrupt ecosystems and damage habitats, which ultimately lead to species extinction. Biodiversity loss not only destroys the beauty of nature but reduces the ability of ecosystems to function properly.

Environmental security refers to the natural resources and environment that a country can inhabit in a way that threatens the economic, political and social stability of a country. The concept of environmental security was first expressed as an international policy area in the World Commission on Environment and Development (WCED) (Aksoy Özcan, 2023, p. 77). The WCED concept emphasises the importance of maintaining a balance between natural resource utilisation and environmental sustainability to prevent conflict, ecosystem degradation and other negative impacts.

According to the 2002 Law on Environmental Protection, the 'Living Environment' is the set of interactions of biotic and nonbiotic compounds that promote and maintain life on earth, including the biophysical environment such as air, soil, and water; the diversity of biological ecosystems; human health; cultural, scientific, religious, and social values and heritage. According to the 2011 law on environmental protection is a natural component: air, soil, water, climate, flora and fauna in the totality of interactions with each other, as well as cultural heritage, as part of the man-made environment. Meanwhile, environmental damage is damage that occurs to the environment or the loss of natural functions of the constituent parts of the environment, caused by the loss of one of its components, by human intervention in the relationship between the components of the environment and or the natural process of its development. However, environmental protection is carried out through measures taken for the safety of the environment (Ibraj et al., 2024). Environmental protection involves strict enforcement of laws against offences that damage the environment, as well as effective supervision of industrial activities and natural resource use.

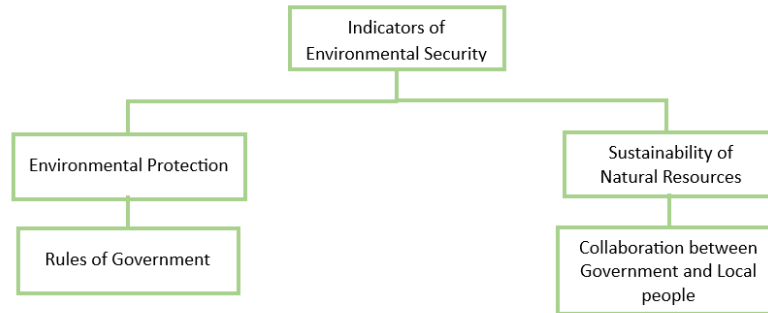


Figure 3. Indicators of Environmental Security

Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) are considered universal goals relevant to both developed and developing countries. They link the economic, social and environmental dimensions of development, moving beyond the narrower focus on poverty and human development that characterised the Millennium Development Goals (MDGs), and combining them with the environmental agenda pursued through the UN Conference on Sustainable Development (UNCSD) since the early 1990s (Gasper et al., 2019, p. 83). Increased awareness of environmental impacts has encouraged countries to integrate sustainability principles into policies.

The term sustainable development and the concept of Sustainable Consumption and Production (SCP) have been growing in popularity, including at successive Conferences. Successive UN Conferences on Sustainable Development. The Rio Declaration on Environment and Development at the 1992 Earth Summit (UN Conference on Environment and Development) called on countries to reduce and eliminate unsustainable production and consumption patterns. Brundtland's focus on consumption norms, standards, and levels was gradually replaced by a focus on production and consumption methods. The follow-up Marrakech Process, launched in 2003, further mainstreamed such notions of SCP and culminated in the adoption of a broad and indicative 10-year Programme Framework on SCP Patterns (10YFP) at the 2012 UN Conference on Sustainable Development, the Rio+20 Conference. The outcome document states that the elimination of poverty, changing unsustainable consumption and production patterns and promoting sustainable consumption and production patterns, as well as protecting and managing natural resources as the basis for economic and social development are key objectives and essential requirements for sustainable development (Gasper et al., 2019, p. 84). Various initiatives and programmes have been developed to support the implementation of Sustainable Consumption and Production Patterns at global, regional and local levels. There is also growing public

awareness of the importance of behavioural change in consumption, and sustainable lifestyles are gaining more attention.

More broadly, the implementation of the 10 Year Framework Programme can contribute to the achievement of most of the targets of SDG 12, particularly those related to natural resource use, waste generation, sustainable corporate practices and reporting, and scientific and technological support to developing countries (Gasper et al., 2019, p. 89). Focusing on the implementation of the 10YFP, countries are expected to develop policies that support sustainable public procurement and raise consumer awareness on the importance of responsible consumption patterns.

One of the key principles of the SDGs is ecosystem conservation. It is necessary to conserve ecosystems and biodiversity because without them, living organisms would cease to exist. The limited means and resources on earth will not be enough to fulfil unlimited human needs. Over-exploitation of resources will negatively impact the environment. Therefore, for development to be sustainable, the exploitation of natural resources must be within the earth's carrying capacity. This means that development activities must be carried out in accordance with the earth's carrying capacity (Mensah, 2019). Apply the principles of prudent and responsible management, where every decision regarding resource use must consider its impact on the ecosystem.

Other perspectives refer to the actions, processes and tools needed to improve and achieve implementation. As raised in the interactive workshop, a critical first step is to get the SDGs onto the policy-making agenda at all levels of governance and even towards citizens themselves, as a 'lack of knowledge' or lack of 'knowledge applied to the SDGs has been widely identified as non-existent'. This step implies not only knowledge creation, but also knowledge transfer or knowledge management. This is considered important given the fact that knowledge may exist (e.g., for synergies/compromises), but is not managed or contextualised within the SDG framework. The complexity of the corresponding SDGs framework should also be addressed and reduced (Siragusa et al., 2024, p. 24). To achieve this, the development of platforms to exchange information is necessary. SDGs-focused training is also crucial to bolster the capacity of all parties and most importantly the support of government and non-government organisations that will help manage relevant knowledge and information.

Here are the targets and indicators of SDGs 12

Tabel 2. SDGs 12 targets and indicators

Targets	Indicators
12.1 Implement the 10 Year Framework of Programmes on Sustainable Consumption and Production Patterns, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries.	12.1.1 Number of countries developing, adopting or implementing policy instruments aimed at supporting the shift to sustainable consumption and production.
12.2 By 2030, achieve the sustainable management and efficient use of natural resources.	12.2.1 Material footprint, material footprint per capita, and material footprint per GDP. 12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GD.
12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.	12.3.1 (a) Food loss index and (b) food waste index
12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.	12.4.1 Number of parties to international multilateral environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement. 12.4.2 (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment.
12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.	12.5.1 National recycling rate, tons of material recycled.
12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.	12.6.1 Number of companies publishing sustainability reports.
12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities.	12.7.1 Number of countries implementing sustainable public procurement policies and action plans.
12.8 By 2030, ensure that people everywhere have the relevant information and awareness for	12.8.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national

	sustainable development and lifestyles in harmony with nature.	education policies; (b) curricula; (c) teacher education; and (d) student assessment.
12.a	Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production.	12.a.1 Installed renewable energy-generating capacity in developing and developed countries (in watts per capita).
12.b	Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products.	12.b.1 Implementation of standard accounting tools to monitor the economic and environmental aspects of tourism sustainability.
12.c	Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities.	12.c.1 Amount of fossil-fuel subsidies (production and consumption) per unit of GDP.

Source: <https://unstats.un.org/sdgs/indicators/indicators-list/>

This study will analyze the following targets and indicators.



Figure 4. Sustainable Development Goals Targets and Indicators

Source: <https://unstats.un.org/sdgs/indicators/indicators-list/>

4. ANALYSIS

The environmental security component is identified as the sustainability of human needs (water, food, shelter, etc.). This is a serious issue that can ultimately lead to disasters, regional tensions and violence and impact the human and social spheres of life (Aksoy Özcan, 2023, p. 87). Maintaining the sustainability of natural resources is crucial to prevent instability that can disrupt the order of society, both locally and globally. The indicator of environmental protection, which is one of the indicators of environmental security, plays an important role in the sustainability of human needs by following government laws.

Economic sustainability relies on the proper implementation of production, distribution, and consumption, while environmental sustainability is driven by proper physical and land use planning and ecological or biodiversity conservation (Mensah, 2019, p. 15). The synergy between these two aspects is crucial in creating an efficient and sustainable system so that the economy not only meets current needs but also protects the environment. In this context, target 12.2 with indicator 12.2.1 is linked to sustainability and efficient use of resources driven by proper planning and land use.

Sustainable development relates to the principle of fulfilling human development goals while at the same time maintaining the ability of natural systems to provide the natural resources and ecosystem services on which economies and societies depend (Mensah, 2019, p. 15). Sustainability should be a cornerstone in designing development policies and strategies. Global concern has always been for the wise use of available resources. In this context, 12.2 with indicator 12.2.1 and indicator 12.2.2 focuses on sustainable achievement plans and efficient use of natural resources.

Conservation of the natural, cultural and built environment is a major factor driving tourism projects. Sustainability and climate-related measures are very important because tourists will see and appreciate pro-environmental measures in a destination and tend to perceive the place as more environmentally friendly and sustainable after they leave it (Khizar et al., 2023, p. 6). In tourism projects, it is important to manage natural resources wisely to ensure the ecosystem remains healthy. In addition, involving local communities in project planning is crucial in ensuring that traditions and ways of life in the region are not displaced by outside cultures due to this tourism. From the beginning, it has been discussed that the conservation of the natural environment, culture and environment is a major factor for tourism projects so it falls into target 12.b with indicator 12.b.1 which confirms that in developing and implementing tools to monitor development impacts, standardised

accounting tools need to be applied to monitor the economic and environmental aspects of tourism sustainability.

Sustainable development is concerned with the principle of fulfilling human development goals and at the same time maintaining the ability of natural systems to provide natural resources and ecosystem services on which the economy and society depend (Mensah, 2019, p. 15). Sustainability should be a cornerstone in designing development policies and strategies. Global concern always speaks of the wise use of available resources. Target 12.2 and indicator 12.2.1 are appropriate indicators of sustainable development related to the fulfillment of development goals in maintaining the capabilities of natural systems and Natural Resources.

Environmental and Economic Conditions of the Kodingareng Island

Environmental safety is inextricably linked with environmental degradation, which affects the well-being of people and all living and non-living organisms. HDR 1994 briefly discusses a wide range of environmental threats that occur primarily due to air, water, and soil pollution, as well as their impact on countries, people, and ecosystems. All these threats are manifested in the form of climate change, drought, floods, which have a direct and or indirect impact on human security. Environmental degradation has always had a major impact on non-traditional security, affecting human security in particular (Ahluwalia, 2020). Environmental degradation has repercussions for all organisms. In this context, the sustainability of natural resources indicator is related to environmental security with the collaboration of the government and local residents in achieving this indicator. A woman entrepreneur who lives on the coast said that floods had hit residential areas in 2022 which resulted in some residents fleeing to other family homes in 2024 (interview, Kodingareng Lompo Island, September 28, 2024). In this case, it has been explained that the sustainability of natural resources is very important in the survival of a region.



Figure 5. Interview with informant

Coastal areas are under pressure from various direct drivers, such as increased demand for human settlements as well as socio-political and economic development. In addition to these direct drivers, there are indirect drivers, such as climate variability, that exacerbate the degradation of natural coastal conditions. Coastal areas often host high levels of biodiversity and increase in important ecological value. Coastal ecosystem services, such as flood protection, biodiversity, and fisheries, can be depressed by human actions such as the expansion of ports and beaches. The trade-off that takes place between population increase and the utilization of coastal areas is further complicated by the impacts of climate change that are already occurring and that are yet to come. Preparation and adaptation strategies to deal with associated sea level rise (Schipper et al., 2021, p. 1). Coastal areas have a lot of biodiversity that must be protected by the government to ensure the sustainability of coastal ecosystems to avoid disasters such as floods that can damage natural assets in the region. In this issue, it is included in the Environmental protection indicator which is one of the focuses of environmental security. This indicator leads to environmental safety referring to government legislation contained in the law on the protection of the environment of 2002. A woman entrepreneur and Rukun Warga 1 who live around the coast said that some of the residents' houses were hit by waves during the rainy season and even floods had entered residential areas (interview, Kodingareng Lompo Island, September 28, 2024). This highlights the need for immediate action to protect coastal areas and communities living in the vicinity.



Figure 6. Interview with informant

The ecological impact of sand mining projects beyond the aquatic environment will affect ecosystems such as habitat destruction, loss of biodiversity and disruption of ecological processes which is one of the main concerns. In addition, sand mining has an impact on fish population decline and ecosystem resilience. Suspended particles such as sediment, organic matter and plankton will cause turbidity of the water which can interfere with feeding and navigation of the fish (Poonia et al., 2024, p. 313). Disruption of fish feeding and navigation will cause population decline and even habitat destruction which is very detrimental to the area, especially fishermen who will experience a decrease in catch

due to the impact of sand mining. In this regard, target 12.4 and indicator 12.4.2 are relevant because sand mining causes water turbidity and damage to aquatic ecosystems that fall within the context of water pollution and environmental impacts. A fisherman and Rukun Tetangga 1 who sometimes becomes a fisherman in his spare time said that sand mining was carried out in the Copong area, Sangkarrang which caused cloudy water around the mining area. As a result, the fish in the Kodingareng fishing catch area began to decline from 2019 to 2024 (interview, Kodingareng Lompo Island, September 28, 2024). The impact of sand mining is strongly felt by fishermen resulting in a decrease in income.

Sand mining activities have undoubtedly affected the non-physical conditions of the settlement environment, namely the economic conditions of the community, such as the existence of such mining activities. Many residents complain about the problems caused by such activities (Susanti et al., 2023, p. 2). In this sand mining greatly affects the economy of the community. In this case, target 12.2 with indicator 12.2.2 relevant to sand mining that affects the sustainability of Natural Resources and the economy of the community on Kodingareng island. In an interview, two women entrepreneurs stated that sand mining is very impactful on the family economy because their husbands do not have an income as fishermen anymore. The very low catch from 2019 made mothers on Kodingareng Island have to trade to help improve the economy (interview, Kodingareng Lompo Island, September 28, 2024). The economic impact felt by women on the island reflects the instability of the domestic economy due to the exploitation of Natural Resources indicating the need for action to support a sustainable local economy.



Figure 7. interview with informan

Governments and tourism policymakers need to significantly change their mindset and implement effective policies and regulatory frameworks if they are to do more than lip service to the Sustainable Development Goals (SDGs) (Khizar et al., 2023, p. 5). In this regard, the government should focus on the sustainable development of tourism taking into

account social, economic and environmental impacts. This includes efforts to conserve natural resources, protect local cultures and empower local communities. In addition, the policies implemented must be able to encourage active participation from all stakeholders, including the private sector and local communities, in maintaining a balance between Tourism Development and environmental sustainability. This is in accordance with the sustainability of natural resources indicator in environmental security where environmental security is carried out by the government and the community to participate in helping the sustainability of the region. A Rukun Warga 1 said that the wave barrier has been installed by the government but has been damaged in 2023, for now the breakwater is needed on Kodingareng island because the waves are getting higher in this area (interview, Kodingareng Lompo Island, September 28, 2024). In this case, the role of the government is very important in improving environmental conditions on Kodingareng island in the form of making breakwaters.

5. CONCLUSION

Sand mining is an activity of sand extraction from seabed locations that causes environmental degradation, such as coastal erosion, loss of marine habitat, and degradation of coastal ecosystems. Sand mining activities occurred on Kodingareng Lompo Island from 2019 to 2020, directly affecting the area. Until now, residents have still felt the impact of these activities. This negative impact affects the environment and the economy of local communities that depend on coastal resources such as fishermen's catch.

Sustainable Development Goal (SDG) 12 emphasizes the importance of sustainable consumption and production patterns for the environment. This study emphasizes that uncontrolled sand mining activities will contradict the principle of sustainability. Managing natural resources wisely will maintain the balance of the ecosystem and protect the long-term economic potential of coastal communities. Stricter regulations and sustainable resource management policies are urgently needed to implement the targets and indicators of SDG 12. The government and stakeholders should consider implementing environmentally sound mining practices and strengthening supervision to ensure that resource exploitation does not exceed capacity. Overall, this study presents a specific understanding of the relationship between sand mining activities and the achievement of SDGs 12 and provides relevant policy recommendations to improve environmental sustainability in coastal areas.

REFERENCES

- Ahluwalia, V. (2020). Environmental security: The challenge of future. *CLAWS Journal*, 13.
- Aksoy Özcan, B. (2023). Defining environmental security as a national security issue. *International Journal of Politics and Security*, 5(1), 73–94. <https://doi.org/10.53451/ijps.1178361>
- Baloch, Q. B., Shah, S. N., Iqbal, N., Sheeraz, M., Asadullah, M., Mahar, S., & Khan, A. U. (2023). Impact of tourism development upon environmental sustainability: A suggested framework for sustainable ecotourism. *Environmental Science and Pollution Research*, 30(3), 5917–5930. <https://doi.org/10.1007/s11356-022-22496-w>
- BPS. (2020). *Kecamatan Kepulauan Sangkarrang dalam angka 2020*. <https://makassarkota.bps.go.id/id/publication/2020/10/26/361b0d31f0302a2cbd54bd0b/kecamatan-kepulauan-sangkarrang-dalam-angka-2020.html>
- BPS. (2021). *Kecamatan Kepulauan Sangkarrang dalam angka 2021*. <https://makassarkota.bps.go.id/id/publication/2021/09/26/d4d75164bff1a0dea1156423/kecamatan-kepulauan-sangkarrang-dalam-angka-2021.html>
- BPS. (2022). *Kecamatan Kepulauan Sangkarrang dalam angka 2022*. <https://makassarkota.bps.go.id/id/publication/2022/09/26/8f0c9c4f0a3375cb7e92e014/kecamatan-kepulauan-sangkarrang-dalam-angka-2022.html>
- BPS. (2023). *Kecamatan Kepulauan Sangkarrang dalam angka 2023*. <https://makassarkota.bps.go.id/id/publication/2023/09/26/c9e05da4ff223d7d082ea3f2/kecamatan-kepulauan-sangkarrang-dalam-angka-2023.html>
- BPS. (2024). *Kecamatan Kepulauan Sangkarrang dalam angka 2024*. <https://makassarkota.bps.go.id/id/publication/2024/09/26/4d9a9fd209ad002df0709587/kecamatan-kepulauan-sangkarrang-dalam-angka-2024.html>
- Chandra, W. (2021). Begini nasib perempuan Pulau Kodingareng setelah penambangan pasir laut berakhir. *Mongabay*. <https://www.mongabay.co.id/2021/05/28/begini-nasib-perempuan-pulau-kodingareng-setelah-penambangan-pasir-laut-berakhir/>
- Gaspar, D., Shah, A., & Tankha, S. (2019). The framing of sustainable consumption and production in SDG 12. *Global Policy*, 10, 83–95. <https://doi.org/10.1111/1758-5899.12592>
- Ibraj, B., Alushllari, M., & Hysa, F. (2024). Environmental security, environmental crime, and national security. *International Journal of Religion*, 5(11), 4890–4900. <https://doi.org/10.61707/1ky4w568>
- Idrus, I., Latif, S., & Rumata, N. A. (2023). Pemetaan tipologi perumahan Pulau Kodingareng Lompo. *Journal of Green Complex Engineering*, 1(1), 33–40. <https://doi.org/10.59810/greenplexresearch.v1i1.67>
- Khizar, H. M. U., Younas, A., Kumar, S., Akbar, A., & Poulouva, P. (2023). The progression of sustainable development goals in tourism: A systematic literature review of past

- achievements and future promises. *Journal of Innovation and Knowledge*, 8(4). <https://doi.org/10.1016/j.jik.2023.100442>
- Liodakis, G. (2023). Tourism, value appropriation, and ecological degradation. *Tourism and Hospitality*, 4(3), 406–418. <https://doi.org/10.3390/tourhosp4030025>
- Mensah, J. (2019). Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review. *Cogent Social Sciences*, 5(1). <https://doi.org/10.1080/23311886.2019.1653531>
- Poonia, K., Kansara, P., & Choudhary, P. (2024). Environmental impacts of sand mining: A comprehensive review. *IARJSET*, 11(3). <https://doi.org/10.17148/iarjset.2024.11349>
- Schipper, C. A., Dekker, G. G. J., de Visser, B., Bolman, B., & Lodder, Q. (2021). Characterization of SDGs towards coastal management: Sustainability performance and cross-linking consequences. *Sustainability (Switzerland)*, 13(3), 1–33. <https://doi.org/10.3390/su13031560>
- Siragusa, A., Chaniotakis, E., Tzanis, D., & Stamos, I. (2024). Scoping SDG interlinkages and methods to infer them. *International Journal of Sustainable Development*, 1(1). <https://doi.org/10.1504/ijsd.2024.10065655>
- Soni, M., Shrimali, P., Kumar, P., Rajpurohit, Y. S., & Choudhary, P. (2024). Mitigating the groundwater impacts of sand mining: Strategies for sustainable extraction and site rehabilitation. *IARJSET*, 11(5). <https://doi.org/10.17148/iarjset.2024.11542>
- Susanti, F., Lestari, S. A. P., & Nugraha, R. F. A. (2023). The impact of sand mining on the socio-economic community. *IOP Conference Series: Earth and Environmental Science*, 1175(1). <https://doi.org/10.1088/1755-1315/1175/1/012024>
- United Nations. (n.d.). *Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development*. <https://unstats.un.org/sdgs/indicators/indicators-list/>