



The Relationship Between Blue Accounting, Marine Policy and Climate Change To The Sustainability Of Marine Ecosystems

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Abstract: Indonesia is the world's largest archipelago, rich in marine resources. However, the management of these resources faces a number of challenges, including overexploitation, climate change and uncoordinated policies. This research aims to assess how blue accounting, marine policy and climate change affect the sustainability of marine ecosystems. Blue accounting is a strategy for measuring the economic, social and environmental value of marine ecosystems. It supports environmentally sound business practices and increases transparency in the management of marine resources. Marine policies, such as the World Maritime Axis vision and PIT, aim to ensure the sustainable use of the oceans. However, overlapping regulations, resource exploitation and climate change impacts such as extreme weather events and sea level rise are degrading marine ecosystems and threatening coastal communities. This research uses a descriptive qualitative method with a literature review approach to explore the relationship between these three factors. The results show that the implementation of blue accounting and appropriate marine policies, coupled with climate change mitigation, can maintain the sustainability of marine ecosystems and support sustainable economic development.

Keywords: Marine ecosystems; marine policy; climate change; blue accounting

Introduction

Indonesia, known as an archipelago, has a marine area of 5.8 million km², including 3.25 million km² of ocean and 2.55 million km² of Exclusive Economic Zone. Its coastline is 108,000 km long (KKP, 2022). As the largest archipelago in the world, it is certainly a valuable asset to be protected. Unfortunately, despite Indonesia's abundant marine resources, many people have not been able to better use and protect the sea. Marine resources such as fish, coral reefs and other marine life are often over-exploited and explosives are used that can damage the aquatic environment. According to the Central Bureau of Statistics (2023), there are many factors that pose challenges and threats to achieving a sustainable ocean economy, including global climate change, overfishing, marine litter and pollution, unsustainable coastal development, shrinking marine habitats, illegal, unreported and unregulated (IUU) fishing, lack of adequate infrastructure and technology. Changes in policy and legislation that are not coordinated or consistent can

create uncertainty for marine and fisheries stakeholders. Nugraha (2017) found that marine pollution from industrial, agricultural, and household waste disposal can threaten coastal and small island ecosystems. This waste can damage coral reefs, mangroves and other coastal ecosystems. Overuse of pesticides and agrochemicals can also pollute water and damage biodiversity. If coral reefs and mangroves are damaged, or if destructive fishing takes place, it is estimated that Indonesia could lose up to two thousand small islands that could potentially sink by 2030.

On the 8th World Oceans Day, Indonesia, as an archipelagic country, also feels the threat of marine degradation. This is caused by extractive industrial activities that exploit marine resources. Worse, the threat of m

arine degradation in Indonesia is also influenced by the overlap of existing laws and regulations. The Indonesian Forum for the Environment (Walhi) admitted that the current threat could destroy the sea and exacerbate the effects of climate change. Walhi's national coastal and marine campaigner, Parid Ridwanuddin, said that the sea is the balance of life on earth. According to him, the birth of PP No. 26/2023 on the management of marine sedimentation results could accelerate the sinking of small islands and coastal villages because it legalises sand mining in the sea (Ambari, 2023). From these problems, we realise that damage to marine ecosystems not only impacts the environment, but also generates economic risks due to the absence of a management system that can integrate the environment, economy and society holistically. Current management only focuses on economic benefits and often ignores the value of ecosystems damaged by overexploitation. For example, ecosystem losses such as coral reef loss or mangrove degradation are not reflected in government or corporate financial reports. As a result, policy decisions are often based on data that does not reflect the true impact on the sustainability of marine resources. Therefore, Indonesia's marine resource management can be optimised through blue accounting, which integrates accounting principles to ensure ecosystem sustainability and record economic, social and environmental benefits.

Based on this problem, the author then took the initiative to study and analyse the relationship between blue accounting, marine policy, and climate change in an effort to maintain the sustainability of marine ecosystems. Exploring how these three factors are interconnected and contribute to the sustainability of marine ecosystems and the application of environmental accounting principles can support more effective marine policies, and can overcome the impacts of climate change on marine ecosystems.

Literature Review

Legitimacy Theory

Legitimacy theory explains that companies disclose social and environmental responsibilities to gain acceptance from society (Amanda Oktariyani, 2024). Based on the concept of social contract, this theory states that organizations must meet society's expectations to be recognized and accepted. By demonstrating social and environmental responsibility, organizations can maintain their legitimacy in the eyes of the public. This theory emphasizes the importance of corporate environmental and social concerns when carrying out operations. With this attention and concern, companies can protect the

community and gain acceptance from the community and investors (Yusri, 2020).

Sustainability Theory

Sustainability theory explains that society's efforts to prioritize social responses to environmental and economic problems (Mungtikaningtiyas, 2020). Sustainability theory focuses on the principles of sustainability, such as the ability of a system, organization, or society to meet current needs without compromising the ability of future generations to meet their needs. In the context of organizations or companies, sustainability theory is often used to emphasize the importance of social and environmental responsibility in business strategies, such as sustainability reporting, waste management, or the adoption of environmentally friendly technologies. The theory seeks to integrate long-term goals oriented towards human and environmental survival, so that sustainability becomes an integral part of decision-making in various fields, including economics, public policy, and management.

Blue Accounting

Blue Accounting is an innovative approach designed to support data-driven management of natural resources, particularly water and marine resources. It emphasizes the importance of collaboration between governments, the private sector, community organizations and researchers in ensuring sustainable resource use. As a strategy for managing water resources in a coordinated and sustainable manner, Blue Accounting focuses on collecting, reporting and using evidence-based data that can support better decision-making in the management of aquatic ecosystems, including rivers, lakes, coasts and seas. As a platform for efficient water resources management, Blue Accounting provides integrated data that enables stakeholders to gain a comprehensive understanding of the condition of water resources. The available data covers water quality, quantity, as well as the impact of human activities, which forms the basis for appropriate policy-making. In addition, Blue Accounting serves to support sustainable development by ensuring a balance between environmental, social and economic aspects. This approach encourages integration across sectors, so that the benefits of water ecosystems can be enjoyed by various parties without compromising their sustainability (Yetti Yuniati, Melvi Ulvan, 2016).

Marine Policy

The Indonesian Maritime Policy is the main guide in formulating marine policies and implementation measures through programs and activities of ministries or institutions related to the marine sector. This policy was prepared to support the accelerated implementation of the World Maritime Axis (PMD), which was launched by President Joko Widodo with the aim of making Indonesia a global maritime power. There are several factors that hinder this achievement, one of which is the development paradigm that does not pay attention to the marine sector as a major force, both in terms of economy, geopolitics and ecology. In addition, another fundamental problem is the weak law enforcement in the marine sector, which has led to illegal, unreported, and unregulated (IUU) fishing, as well as various other crimes at sea, such as smuggling, piracy, and damage to the marine environment. By strengthening marine policy and optimizing the role and contribution of the maritime sector, Indonesia can accelerate the achievement of the World Maritime Axis

vision. Overall, Indonesia's maritime policy should cover various aspects that are integrated and mutually supportive, ranging from strengthening infrastructure, effective law enforcement, to the implementation of international obligations within the UNCLOS framework (Zulkifli et al., 2023).

Climate Change

Climate change refers to long-term changes in weather patterns occurring globally, which will fundamentally affect human life. The threats posed by climate change are real and damaging, affecting water, habitat, forests, health, agriculture and coastal conditions. Climate change can lead to declines in water quality and quantity. Extreme temperature rises, for example, can reduce the amount of chlorine in water, allowing an increase in the number of harmful microorganisms in it. The impacts of climate change can be seen in two main ways: habitat change and species extinction. Rising temperatures, rising sea levels, flooding and storms caused by extreme weather have a major impact on the condition of the natural habitats in which many species of animals, plants and other organisms live. This habitat destruction threatens the survival of the organisms that depend on it. Species extinction becomes a real threat when their habitats are damaged, which in turn directly affects ecosystems and food chains (Haryanto & Prahara, 2019). After conducting various studies, experts found that the main cause of climate change is the accumulation of greenhouse gases such as CO₂ (carbon dioxide), CH₄ (methane), and N₂O (nitrous oxide) in the Earth's atmosphere. In some areas, there is even damage to the ozone layer which causes negative effects on the lives of living things on this planet. Indonesia, as a country that is located on the equator and has a large area of forest, has an important role in global climate change. Indonesia can worsen the environment and cause more extreme climate change, or vice versa, Indonesia can play a role in reducing greenhouse gas emissions, absorbing these emissions, and preserving the world's environment (Bakker, 2014).

Marine Ecosystem

In general, an ecosystem is an ecological system formed from interactions between living things and their surrounding physical environment. Ecosystems consist of various interconnected biosystem units, encompassing the reciprocal relationship between organisms and the physical environment. In ecosystems, energy flows lead to specific biotic structures, which then trigger material cycles between living organisms and inorganic components (Syekh & Cirebon, n.d.). So it can also be said that marine ecosystems are complex and dynamic ecological systems, consisting of producers (such as phytoplankton), consumers (such as fish), and decomposers (such as bacteria). Interactions between organisms and the physical environment (such as temperature and salinity) create a balance that is essential for the survival of marine ecosystems. Energy flows through food chains, and matter cycles through biogeochemical cycles. Marine ecosystems also play an important role in maintaining global climate balance, providing natural resources and supporting biodiversity. Therefore, efforts to protect and manage marine ecosystems are essential to ensure the survival of the Earth's environment.

Research Method

This research adopted a descriptive qualitative method with a literature study approach. Data and information relevant to the topic were collected from various sources such as national and international research journals, reference books, newspapers, and magazines (Hariyanti & Wirapraja, 2018).

Result and Discussion

Implementation of Blue Accounting for Marine Ecosystems

In general, blue accounting is an approach used in measuring and reporting the economic value derived from marine ecosystems in a sustainable manner between environmental and socio-economic aspects. Research conducted by Negara & Darmawan, (2021) on Jemeluk beach, Bali found that marine tourism entrepreneurs have implemented simple accounting techniques such as general journal recording. The entrepreneurs also hold the responsibilities given, for example, such as snorkeling equipment rental entrepreneurs. These entrepreneurs help the management/cleanup around the beach to plant coral reefs. They also urge visitors not to step on and take the coral reefs. This supports legitimacy theory, where entrepreneurs help the surrounding community in preserving coral reefs to gain support and acceptance from the community and the application of blue accounting in the business that helps reduce environmental problems, helping the reporting process of recording environmental sustainability such as planting coral reefs.

Then, the results of research from Laurentia (2024) which examined the application of blue accounting in CP Prima and Era Mandiri Cemerlang companies, found that each company has its own program regarding blue accounting such as alternative environmentally friendly materials in the production process carried out by PT Central Proteina and the waste treatment program by PT Eka Mandiri Cemerlang. These companies are determined to implement a sustainable renewal program that uses the concept of aquaculture digitalization to encourage the sustainable development of Indonesia. The results of this study also support legitimacy theory which is in line with blue accounting practices that concentrate on the social contract between companies and society, where companies are required to meet community expectations. Hrast (2023), mentioned that the concept of sustainability is closely related to corporate social responsibility. Companies are not only required to pursue financial returns, but are also obliged to consider the social and environmental impacts of their business activities. Sustainability emphasizes the importance of the interdependent relationship between people and the environment in which they live. Sustainability encourages more responsible resource management, giving companies a significant competitive advantage. Companies that successfully implement sustainable business models often enjoy higher profit margins, increased productivity and more solid relationships with customers. This is due to consumers' preference for sustainably produced products, which are not only of high quality, but also have a positive impact on the environment (Gary Langenwalter, 2007).

However, previous research by Hanoeboen (2017), Prasetyo (2020), and (Purbani

(2016) showed similarities in their findings, namely low public awareness in protecting the environment and limited facilities and infrastructure in waste and waste management. This condition has the potential to threaten the sustainability of the beach tourism sector and marine ecosystems in the long term. In addition, Prayuda (2020) found that community productivity in the marine sector tends to be low, although the role of the community is very important in the implementation of blue accounting, especially in coastal areas. Blue accounting is a piece of homework and still needs further research regarding the method of calculation, presentation, and disclosure in the financial statements. IAI needs to consider whether special accounting standards are needed for blue accounting in the financial statements of business units, especially businesses in the tourism sector and beach tourism (Ardiansyah & Umarella, 2022). Blue accounting helps in the management of marine resources and can assess the impact caused to avoid overfishing, damage to marine biota, and maintain the sustainability of the marine ecosystem.

Impact of ocean policy on marine ecosystems

Marine policy is a set of regulations and strategies designed to sustainably manage marine and coastal resources. In Indonesia, this policy involves marine area management, ecosystem protection and maritime economic development. Indonesia's Maritime Vision is to make the country the World Maritime Axis, an advanced, sovereign, independent, resilient maritime nation that contributes positively to regional and global security and peace, in line with national interests. Indonesia's Maritime Policy is designed based on the National Development Vision contained in Law Number 17 of 2007 concerning the National Long-Term Development Plan 2005-2025 and Law Number 32 of 2014 concerning maritime affairs (Susetyorini, 2019). This law specifically regulates all aspects of marine affairs, from resource management, marine areas, to law enforcement at sea. This approach integrates environmental and social aspects to ensure that the utilization of marine resources does not compromise the sustainability of the ecosystem in the future. The minister of fisheries and marine affairs has also developed 5 blue economy policies as a step to encourage the sustainable utilization of marine resources and fisheries.

However, the implementation of marine policy in Indonesia faces challenges, such as ecosystem damage due to overexploitation, lack of law enforcement, and low public awareness. Exploitation of marine sedimentation is a serious concern in efforts to preserve the marine environment. Exploitation without considering the balance of the ecosystem can threaten the sustainability of the marine ecosystem. To address this issue, the government issued Government Regulation No. 26 of 2023 on the Management of Sedimentation Results in the Sea, which includes provisions for administrative sanctions. Article 23 paragraph (1) stipulates that business actors who violate the obligations as stipulated in several articles, including Article 9 to Article 21, will be subject to administrative sanctions. Paragraph (2) details the sanctions, including: written warnings, temporary suspension of activities, license revocation, total suspension of activities, and administrative fines. This regulation aims to maintain the balance of the marine ecosystem, but it also has the potential to cause risks, such as increasing threats to the survival of small coastal islands that could lead to

their sinking. Although the goal is to maintain the balance of the marine ecosystem, many have criticized the regulation for its potentially serious negative impacts on the environment and coastal communities. Over-exploitation of marine sand can cause environmental damage, such as pollution, abrasion, coastal erosion, and deterioration of seawater quality, which have serious impacts on human health. To prevent these negative impacts, controlled management of natural resources, socialization of the importance of mangrove forests, and patrolling of coastal areas by authorities are needed. In addition, the active role of the community is also very important in preventing exploitation that damages the environment (K. P. Nugraha, 2024).

Good policies will have a positive impact on marine ecosystems, supporting resource sustainability and environmental balance. Conversely, poorly designed policies that do not consider sustainability can worsen environmental damage, threaten the lives of marine life, and harm coastal communities who depend on the sea for their livelihoods.

Impacts of Climate Change on Marine Ecosystems

Climate change is one of the consequences of global warming that can affect life in land areas, sea areas, or transitional areas of land and sea (coastal). The overuse of coastal resources and irresponsible behavior of people are damaging the coastal environment. Climate change is causing changes in salinity, extreme weather, and impacts such as higher waves, faster currents, and more intense storms that impact marine ecosystems, changes in fishing seasons, and shifts in fishing locations. Rising sea levels also threaten coastal communities that depend on the ocean. Storms can hinder fishermen's activities, even jeopardizing their safety. In addition, climate change threatens sensitive marine life and can lead to the extinction of certain species. Sea level rise also results in disasters such as flooding, coastal erosion and the loss of mangroves that serve as a protective barrier. As well as seawater intrusion, which is the event of seawater entering the soil, damaging groundwater quality, disrupting the availability of clean water, and increasing its vulnerability to damage from high ocean waves. This makes coastal areas increasingly vulnerable to environmental damage and difficulties in obtaining fresh water (Subagiyo, 2021).

An interview conducted by the Alliance of Independent Journals (2024) together with USAID Indonesia through the USAID Ber-IKAN (Bersama Kelola Perikanan) Project in collaboration with the Ministry of Maritime Affairs and Fisheries and a tuna fisherman from Kawa Village, West Seram district, Maluku Province, Yadi Bustan, explained that in addition to increasing operational costs due to longer trips to catch fish, traditional fishermen also have to compete with large vessels operating in their fishing areas. Climate change in recent years is considered to be a factor that aggravates the challenges in the marine and fisheries ecosystem. In addition to reducing fish populations, these changes also threaten the safety of small-scale fishers at sea, as higher ocean waves due to climate change increase their risk of harm. Djoko Arye Prasetyo, Head of the Public Relations and Cooperation Team of the Directorate General of Capture Fisheries, Ministry of Maritime Affairs and Fisheries, stated that climate change has a significant impact on the quality of

catch and the welfare of traditional fishers. He emphasized the need for policy transformation through the implementation of Government Regulation (PP) No. 11/2023 on Measured Fishing (PIT). This policy, part of the five Blue Economy 2024 priority programs, aims to ensure the sustainability of fish resources, increase productivity, and support the welfare of fishermen, as mandated by Law No. 31/2004 on Fisheries. PP No. 11/2023 regulates the division of fishing zones in Fisheries Management Areas (WPP) into three: industrial zones, local fishermen zones, and fish spawning and breeding zones. The government sets fishing quotas based on the categories of industry, local fishermen, and recreation or hobby. Local fishermen are given the freedom to fish without zone restrictions, while the industrial zone is more strictly regulated, including operating licenses, vessel types, and annual catch amounts. The PIT policy also reflects the government's partiality towards small and traditional fishermen, as well as a solution to various problems in the capture fisheries sector.

Conclusion

The implementation of blue accounting, marine policy and the impacts of climate change are strongly linked to the sustainability of marine ecosystems. Blue accounting is an important approach in measuring and reporting the economic value of marine ecosystems, while encouraging more environmentally friendly business practices. However, challenges such as low public awareness, limited infrastructure, and non-standardized reporting methods still need to be overcome. Indonesia's marine policies, such as the World Maritime Axis vision and regulations related to marine resource management, aim to support sustainable use. However, overexploitation, lack of law enforcement and poorly thought-out policies can exacerbate damage to marine ecosystems. On the other hand, climate change is worsening the condition of marine ecosystems through extreme weather, sea level rise, and disruptions to fishing patterns. PIT is implemented to ensure a balance between the utilization and conservation of marine resources, while protecting small-scale fishers. Thus, the relationship between the application of blue accounting, sound marine policies, and efforts to address the impacts of climate change is key to maintaining the sustainability of marine ecosystems, supporting the welfare of coastal communities, and promoting sustainable development.

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