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Multi-Aspect Analysis of Land Sand Mining Implications in Bintan Regency

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ABSTRACT

This research examines the various implications of land-based sand mining activities in Bintan Regency, which have been ongoing since the 1980s. These activities are closely associated with significant environmental impacts resulting from mining processes that alter the landscape, causing changes to the physical, chemical, and biological environment. One notable outcome is the creation of the Telaga Biru Desert in Bintan Regency, which has become a popular natural tourist destination since 2015. The reutilization of post-mining areas after years of abandonment raises a critical question: How does the government address the multi-dimensional implications of land sand mining? These impacts encompass both positive outcomes, such as economic opportunities, and negative consequences, including risks to the physical and non-physical environment, as well as socio-economic challenges. This study adopts a descriptive and qualitative approach, utilizing primary and secondary data collection, processing, and analysis. The findings reveal that land-based sand mining activities in Bintan Regency have led to significant environmental and socio-economic consequences, including landscape alterations, biodiversity loss, and water pollution. Economically, the transformation of Telaga Biru Desert into a tourist destination highlights the potential for alternative uses of post-mining areas. However, the findings underscore the urgent need for clear governance frameworks to balance economic development with environmental sustainability.

Keywords: *Environmental Impact; Land Sand Mining; Post-Mining Area Management; Socio-Economic Implications; Sustainable Governance*

1. Introduction

The exploitation of natural resources has long been a double-edged sword in economic development. On one hand, it drives economic growth and provides essential materials for infrastructure and industrial progress. On the other hand, it often results in significant environmental degradation and socio-economic disparities. Sand mining, as one of the most pervasive forms of resource extraction, exemplifies this dilemma. In Indonesia, sand mining activities—both marine and land-based—have sparked intense debate due to their environmental and economic implications. While marine sand mining has received considerable attention, land sand mining remains relatively underexplored despite its growing impact on ecosystems and communities, particularly in regions like the Riau Islands.

This research focuses on the implications of land sand mining activities in Bintan Regency, specifically in Busung Village, Seri Kuala Lobam sub-district. The mining activities, which began in the 1980s, have left a lasting imprint on the region, with approximately 6,000 hectares of land abandoned for decades due to mining operations. While the geographical proximity of the Riau Islands to neighboring countries has often spotlighted marine sand mining, land sand mining also plays a critical role as a resource extraction activity in the area. Its impacts extend beyond the physical environment to encompass socio-economic and governance challenges (Gavrileteа, 2017).

Sand mining is inherently linked to environmental alteration. The process changes the physical, chemical, and biological landscape, resulting in habitat destruction, water pollution, and biodiversity loss (Hartati, 2007; Jati, 2013). Defined as the extraction of sand using mechanical or manual methods for economic purposes, sand mining encompasses activities on both land and in subterranean water flows (Manona et al., 2024). However, the long-term implications of land-based sand mining in Indonesia, particularly in regions like Bintan Regency, have been understudied. This research aims to fill that gap by examining the environmental, socio-economic, and governance dimensions of land sand mining activities in the region.

In terms of governance, Indonesia's regulatory framework presents a complex landscape. Marine sand mining is prohibited under Republic of Indonesia Law Number 27 of 2007, revised by Law Number 1 of 2014 on the Management of Coastal Areas and Small Islands (Ambari, 2020). However, Government Regulation Number 26 of 2023 has reintroduced marine sand mining across Indonesia, drawing criticism for its potential environmental harm (Grahadyarini, 2023). Land sand mining, on the other hand, is regulated under Government Regulation Number 37 of 1986. Despite this framework, reports of widespread permits and regulatory ambiguities highlight ongoing challenges in managing sand mining activities.

This study focuses on the long-term implications of land sand mining in Bintan Regency, seeking to bridge the gap in understanding its multi-dimensional impacts. By integrating environmental, socio-economic, and governance perspectives, this research offers actionable insights and recommendations for improving policy frameworks and promoting sustainable post-mining area management. The novelty of this research lies in its focus on balancing economic opportunities with environmental sustainability, contributing to the broader discourse on resource governance in Indonesia.

2. Literature Review

2.1. Exploitation of Resources and Capitalization

Concretely, there is an understanding that business and the environment are two conditions that cannot go together. In practice, one must be sacrificed in favor of the other. Currently,

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globalization, with its capitalistic-motivated trade liberalization, is increasingly manifesting its presence. This condition poses a great threat to the survival of human life on earth (Hartati, 2007). So far, the dominant paradigms that have developed in natural resource governance are developmentalism and neoliberalism, which are very economically centered. In the view of these two paradigms, natural resources are treated as consumptive objects in achieving economic growth and development ratios. This led to excessive exploration and exploitative behavior in extracting the earth's wealth to be used as much as possible for economic interests. The implication that arises then is the destruction of the ecosystem order of the natural environment followed by the presence of natural disasters as a form of nature's anger at greedy humans. It is at this locus that natural resources turn into an economic curse for the modernity of human life (Jati, 2013).

Empirical evidence shows that increasing levels of environmental degradation are often associated with the development of the concept of modernity. In Indonesia, this trend was clearly reflected in the direction of development taken during both the New Order and Reformation periods. During the New Order, there was a strong emphasis on the concept of modernity influenced by W. W. Rostow's theory of the stages of economic growth, which was later realized in the Five Year Development Policy. The implementation of this concept of modernity resulted in massive industrial development. As part of the support for the policy, natural resources were intensively exploited to facilitate the industrialization process, which was considered the main driver toward a more modern society (Mansour, 2006).

Modernity, industrialization, and capitalization are intertwined in the dynamics of economic development. Modernization, as the process of developing modern society, generally requires industrialization as its main driver. Industrialization, in turn, often requires intensive exploitation of natural resources. Furthermore, to realize industrialization, sufficient capital is required, so the door to investment must be widely opened. However, such openings tend to result in the domination of capital owners rather than the active participation of local communities. This stage is often the beginning of economic inequality, which then continues into a broader process of domination. The process of modernization is often inseparable from the accumulation of capital by a few groups, which then has the consequence of domination and over-exploitation of resources. If this situation is allowed to continue without intervention, there will be an increase in social inequality and increasingly severe environmental degradation, approaching rock bottom (Muthmainnah et al., 2020). There is a paradox that occurs in the case of countries rich in natural resources (Karl, 1997; Nwonwu, 2016). However, instead of being rich, they become poor, causing inequality between the state and society. Thus, the presence of natural resources in the community turns into a curse and a disaster because local communities automatically lose their basic source of income.

Governance is one of the most important factors in favoring or damaging the environment (Armitage et al., 2012). The quality of governance, including decision-making processes, policy implementation, and oversight, can influence the effectiveness of environmental conservation or environmental management measures. Suppose good governance is in place, such as transparency, public participation, accountability, and responsiveness to inputs from various stakeholders. In that case, the likelihood of achieving positive outcomes in environmental protection will be greater. However, suppose poor or ineffective governance is applied, such as corruption, lack of public engagement, or decisions that do not take into account environmental impacts. In that case, this can damage the environment and even exacerbate environmental degradation.

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The Political Ecology paradigm emerged as an alternative perspective in natural resource management to build synergy between human and natural relations through local wisdom (Jati, 2013). The emergence of an awareness of the vulnerability of natural disasters caused by greedy behavior in natural resource management created a paradigm shift in resource governance from economic development to sustainable development in the mid-1990s. Nature began to receive political recognition in political studies and economic studies, and it is appropriate that nature and humans are organismic entities that should live together on this earth (Jati, 2013)

Vandana Shiva argues that the dimensions of developmentalism that take place in third-world countries are themselves a continuation of colonialism practices that occurred in the past. Shiva proposed the term 'exploitation syndrome' to criticize the discourse of developmentalism in third-world countries (Shiva, 1994). The syndrome includes two main stages, the second of which is interesting and relevant to this research, namely the establishment of a government bureaucratic apparatus that legalizes and allows the commercialization of public goods because the state's income is highly dependent on the extraction of these natural resources (Jati, 2013).

2.2. Traditional Resource Management vs Political Ecology Resource Management

The concept of private property ownership in natural resource management establishes a hierarchical structure in which state regulators exercise control over natural resources as strategic economic assets. This control is implemented through a series of regulations and binding policies. The hierarchical nature of state control over natural resources is commonly referred to as traditional natural resource management (Adger et al., 2005). The ideological approach of this traditional management model emphasizes developmentism. Within this model, state regulation functions as a market patron, facilitating resource users in the processes of exploration and exploitation of natural resources. Further details are illustrated in the figure below:

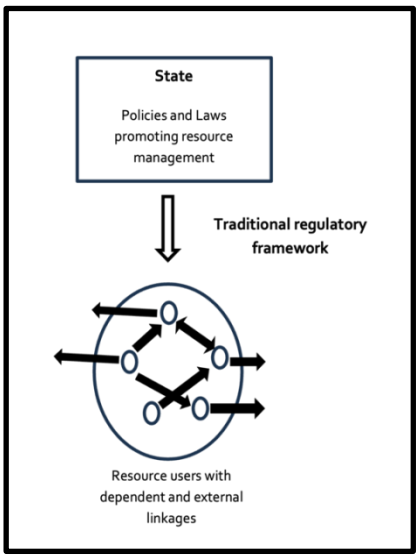

Figure 1. Traditional Resource Management
Source: (Adger et al., 2005)

In the traditional model, the state has a top-down mechanism for managing potential natural resource wealth. This management pattern has become a standard pattern in natural resource management in various third-world countries, and it is widely implemented in various policy products. This is in contrast to the perspective of political ecology, which can be defined as a political study that understands human relations with environmental changes as a result of

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political processes (Dharmawan, 2007). Therefore, ecological-political studies always criticize and question the concept of political economy in developmentalism, which has a major role in environmental change. Shiva explained that clear rules and policy-making are needed in the mechanism of natural resource management. Shiva criticized that so far, the rules of resource governance are not clear and only take place in a top-down manner (Shiva, 1994). Hence, the community only accepts its implementation without being able to protest the rules, which ultimately harms the community as well. Therefore, natural resource management must also provide affirmative action for communities to emerge as important actors in addition to the state and society.

The ecological-political paradigm offers natural resource management based on a synergy between various actors, including the state, civil society, media institutions, and universities or academics. The involvement of the media and universities as institutions that provide ecological knowledge input for the formulation of pro-environmental policies (Bamzai-Dodson et al., 2021).

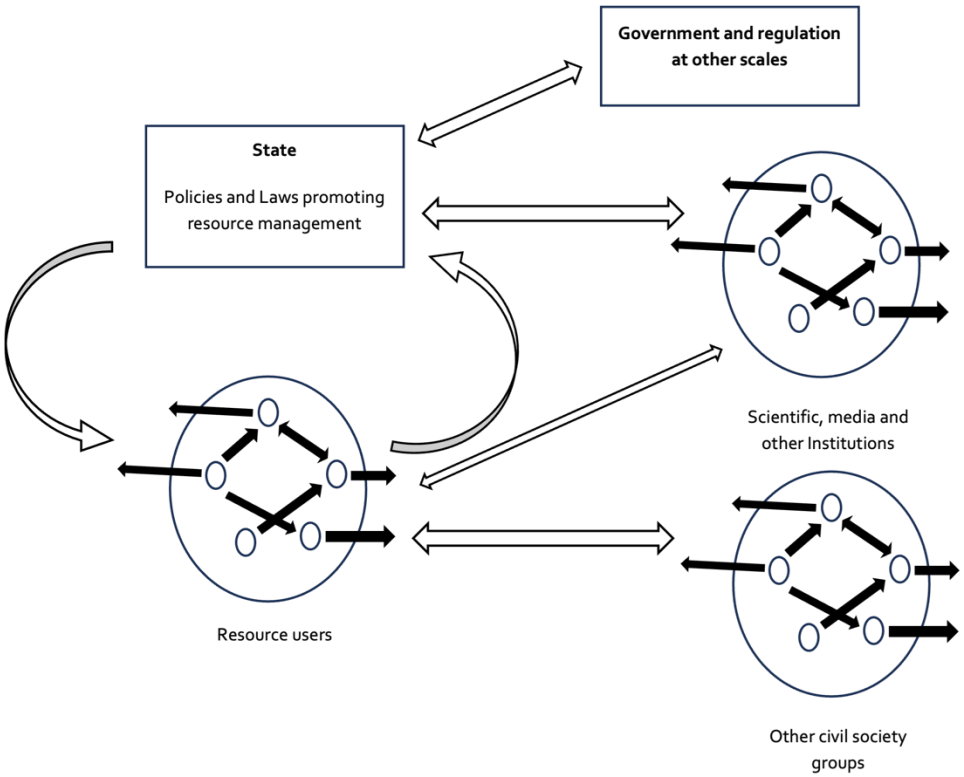

Figure 2. Political Ecology Resource Management
Source: (Adger et al., 2005)

In **Figure 2**, it is clear that the management of natural resources takes place in a decentralized manner, from the state, the community, as well as the media and universities, in their capacity as resource users. This alternative management pattern reduces the role of the market as resource users, which was previously dominant in the centralized management pattern. The strengthening of communities as actors in natural resource governance through their local wisdom needs its own confirmation space.

Soemarwoto explains that impact refers to a change that occurs as a result of an activity (Soemarwoto, 2003). This activity can be of a natural, chemical, physical, or biological nature. Impacts can be positive, resulting in benefits, or negative, involving risks to both the physical

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and non-physical environment, including socio-economic aspects. Frederick defines policy as a series of actions or activities proposed by an individual, group, or government in a specific environment where there are obstacles (difficulties) and opportunities for the implementation of these policy proposals in order to achieve specific goals (Agustino, 2008). This perspective also underscores that policy ideas involve intentional and purposeful behavior, which is an essential part of the policy definition. After all, policies should demonstrate what is actually being done rather than merely what is proposed in some activities related to a particular issue. Therefore, this research is conducted to analyze the various impacts resulting from the local government's policies on natural resources within their region.

Sand mining in the Riau Islands not only occurs in the sea but also on land. This research focuses on land sand mining in Bintan Regency. As a result of these activities, the Telaga Biru Desert emerged in Bintan Regency, gaining popularity as a natural tourist attraction since 2015. It is unclear whether the sand mining activities in the 1970s were legal or illegal. Regardless of their legality, the desert and blue lake appeared as a transformation following post-mining activities. After the mining operation ceased, the unused sand material created a lake. The Telaga Biru Desert has become a popular tourist destination from 2015 to the present. The former mining sites have attracted tourists, as evidenced in Karuniawati's research, which explores the economic valuation and government management opportunities for The Telaga Biru Desert as an alternative tourist destination in Bintan Regency (Karuniawati, 2022). In recent years, tourist attractions that have formed due to changes in land use resulting from mining or natural conditions have become quite popular in eco-tourism circles.

3. Research Methodology

This research was conducted using a descriptive-qualitative approach involving the processing and preparation of both primary and secondary data for analysis. Descriptive studies aim to describe facts, events, or occurrences that have already taken place. Data collection, compilation, and analysis are integral parts of the process. The selection of a qualitative descriptive method is based on the need to elaborate and gain comprehensive insights into the impacts or implications of past activity, in this case, land sand mining activities. The researcher will start by reading through all the data preparing it for analysis. Next, data classification will take place, where the researcher will organize the data based on themes (segments), connecting and describing the processed data for theoretical interpretation and analysis. Primary data was obtained through in-depth interviews with local stakeholders, such as the village government and the manager of the Telaga Biru Desert tourist destination. Site selection was based on the level of significant environmental damage and the potential for utilization of the post-mining area as a tourist attraction. Participant selection was purposive, involving stakeholders directly affected by or involved in the sand mining process and its impacts, including village government officials, tourism managers at Telaga Biru Desert, and residents. Data reliability was ensured through triangulation by combining interview findings with secondary data from government reports, mass media, and previous research to provide a comprehensive perspective on the issue.

4. Results

The mining activity, initially yielding high-value mineral products, eventually leads to collateral impacts that need to be rehabilitated due to the mining's residual effects (Darshana & Samanthika, 2017). A land area of 6,000 hectares left as a result of mining is certainly not a small extent, especially considering that sand mining activities often entail sacrificing forested land.

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This mining activity involves clearing forests around rivers to obtain sand. This is because the sand extracted typically comes from rivers, and rivers are often situated in forested areas. To get the sand, the forest around the river must be cleared. There are several reasons why sand mining is carried out at the expense of forested land. Firstly, river sand is usually of better quality than sea sand. Secondly, river sand is more accessible than sea sand. Thirdly, mining river sand is more cost-effective than mining sea sand.

The sand mining in this area began in the 1980s and continued until the 2000s. After sand mining was halted, the excavated sand pits filled with rainwater were transformed into a lake. The color of the water in this lake appears blue due to the presence of certain minerals in the sand. The blue color becomes even more pronounced during the dry season when the lake water becomes crystal clear. This lake offers a unique and picturesque view, with its expanse of white sand and clear blue water, making it one of the tourist destinations in Bintan Regency.

It is widely acknowledged that the current state of the environment is in a critical crisis, often described as being "damaged everywhere." This crisis extends beyond the physical realm, encompassing water, soil, air, and climate challenges, to biological and social-environmental crises (Susilo, 2012). The environmental crisis represents a severe threat to the sustainability of human life and other living beings on Earth. Indicators of this crisis are multifaceted. Water crises are marked by the scarcity of clean water and widespread pollution, exacerbated by global warming, which disrupts rainfall patterns and increases the risk of drought. Soil degradation is another pressing issue, fueled by deforestation and unsustainable farming practices that compromise soil fertility. Similarly, air pollution from industrial emissions and vehicles significantly harms human health and ecosystems.

Adding to these are climate-related crises, where human activities, particularly the combustion of fossil fuels, drive global temperature rises, trigger extreme weather events, and disrupt seasonal patterns. The biological environmental crisis is evident in the loss of biodiversity caused by habitat destruction, excessive hunting, and climate change, leading to the extinction of various species. Furthermore, the social dimension of this crisis reflects inequality in accessing natural resources and the disproportionate burden of environmental changes on vulnerable communities (Adger et al., 2005). These disparities often result in resource-based conflicts and increased mass migrations. Collectively, these interconnected crises underscore the urgency of addressing environmental challenges holistically to ensure the survival and well-being of all life forms.

Given the crisis conditions, various ideas about environmental sustainability emerge. However, these ideas also raise warnings about the risks associated with the emergence of modern society, particularly in this study, companies engaging in sand mining activities. Even the views of experts such as Anthony Giddens and German sociologist Ulrich Beck make statements not just as warnings but also consider modern humans as a "risk society" (Beck, 1992; Giddens, 1990). Although the mentioned risks do not solely refer to environmental crises, the depiction of environmental disasters resulting from the irresponsible application of technology is evident in both Giddens and Beck's writings. In line with this, Talcott Parsons also outlines approaches that can be taken in environmental conservation efforts.

First, with reference to an individual approach, it is stated that the well-being of the environment depends on individual behavior. According to Parsons, individuals play a crucial role in degrading and preserving the environment as they exhibit voluntaristic behavior (Parsons, 1951). This means that each individual utilizes various means to achieve their goals, and every social action is oriented towards specific objectives. As actors, individuals do not confine themselves to using a single tool; instead, they continuously strive for the effective and

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efficient use of tools to attain their desired goals. Many environmentally harmful behaviors by individuals are closely tied to wealth cultivation goals.

The sand mining activity, sacrificing 6000 hectares of forest land to comply with industrialization desires, has extensive repercussions on the passive natural resources being exploited. The more successful humans are in exploiting natural resources, the more control they gain over their lives and the greater the material income obtained (Haq et al., 2023). Industrialization becomes a concern when it sacrifices the environment, given the environment's dual role as a provider of raw materials and a supporter (infrastructure) in the industrialization process. In this study, sand serves as a raw material, considering its status as a tradable resource (Haq et al., 2023). As a raw material, sand becomes a resource that supports economic activities.

The degradation of lands is inseparable from the crisis of areas due to illegal logging and continuous exploitation, leading to a decline in soil productivity. The forests, which serve as the environmental support system for the world, have suffered damage. According to satellite data analysis released by the University of Maryland (UMD) and the World Resources Institute (WRI), primary forests in tropical regions are rapidly decreasing. Since 2002, tropical areas have lost over 60 million hectares of primary forests, an area equivalent to 1.3 times the size of Sumatra Island. The new data confirms that the loss of primary forests in 2010 was almost 30% higher than in the 2000s (Buttler, 2020).

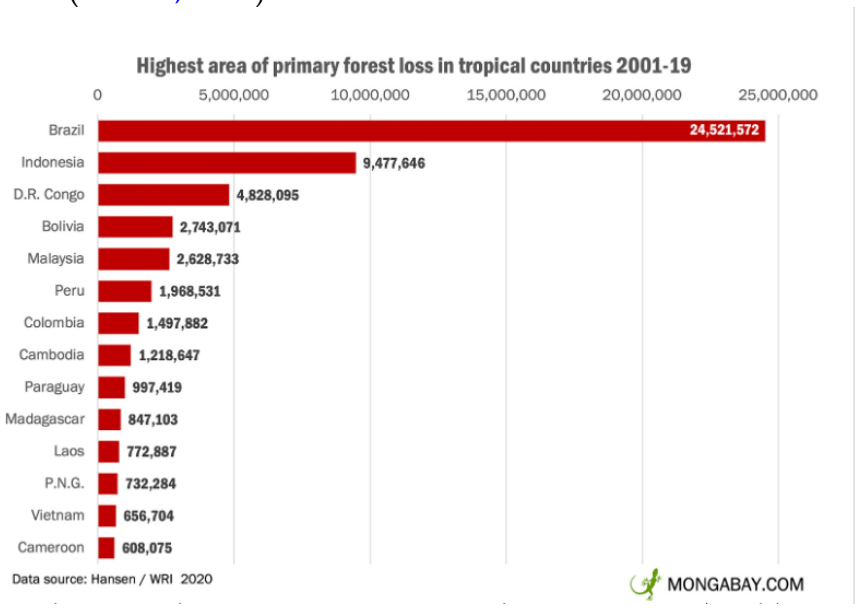

Figure 3. Highest Area of Primary Forest Loss in Tropical Countries (2001–2019)
Source: (Buttler, 2020)

Ten sub-national jurisdictions (provinces, states) contributed to almost half of the loss of tropical primary forests between the period of 2002-2019. The top four contributors are states in Brazil (Pará, Mato Grosso, Rondônia, and Amazonas), four provinces in Indonesia (Riau, Central Kalimantan, West Kalimantan, and East Kalimantan), Santa Cruz (Bolivia), and Sarawak (Malaysia). Although the Riau Islands Province does not rank among the top four provinces contributing to the loss of tropical primary forests, Indonesia holds the second position globally. This signifies the crisis of the issue of losing primary forests as a life-supporting system for the world, particularly considering the crucial role of tropical primary forests in preserving biodiversity, storing carbon, and functioning as a buffer for the global ecosystem.

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Returning to the context of sand mining, unsustainable and uncontrolled sand mining activities can have significant impacts on primary forest areas. Uncontrolled inland sand mining in Bintan Regency in the past has proven to be a serious threat to the sustainability of tropical primary forests and the surrounding life. The mining activity, initially generating high-value mining products, eventually leads to secondary impacts that need restoration due to the excavation remnants from the mining activities. The extensive 6000-hectare land left as excavated areas is considerable, especially considering that sand mining activities involve sacrificing forest land. This mining activity involves clearing forests around rivers to obtain sand. This is because the mined sand usually comes from rivers, and rivers are typically located in forest areas. To extract sand, the forest around the river must be completely cleared. There are several reasons why sand mining is carried out at the expense of forest land. First, river sand is usually of better quality than sea sand. Second, river sand is more easily accessible than sea sand. Third, mining river sand is cheaper than mining sea sand.

In principle, if natural resources are utilized in accordance with individual needs, they will have the ability to regenerate naturally. However, the issue arises when the utilization of natural resources neglects environmental carrying capacity, resulting in environmental degradation, as evidenced in the Telaga Biru Desert. The former sand mining areas in Telaga Biru Desert now appear as sand mounds, and during rainfall, they fill up with rainwater, creating pond-like formations referred to as lakes. However, these areas, which were originally forests, become unusable after sand mining activities due to the potential for landslides in the already damaged soil. An increase in the consumption of natural resources inevitably accompanies the increasing human population. To prevent exceeding carrying capacity limits, efforts are made to ensure that the rate of resource consumption and pollution decreases relative to the improvement in environmental quality. Therefore, the condition for improving quality of life must be pursued simultaneously with the reduction of natural resource consumption and pollution (Kristanto, 2002).

Sand mining took place from the 1980s to the 2000s, or 20 years ago. After the cessation of sand mining, the former sand pits were filled with rainwater and transformed into a lake. The water in this lake has a blue tint due to certain mineral content in the sand. This blue hue becomes more prominent during the dry season when the lake water becomes clear. The lake offers a unique scenery with white sand expanses and a clear blue lake, making it one of the tourist destinations in Bintan Regency. Behind its beauty and allure, some implications arise, not confined to a single aspect but encompassing multiple aspects due to the inland sand mining activities, including:

4.1. Environmental Aspect

1) Changes in Landscape: Alteration of Natural Features

Mining activities can lead to landscape changes, impacting the physical, chemical, and biological aspects of the environment (Koehnken et al., 2020). The physical changes observed in this study include alterations in topography, such as the formation of sand mounds and cliffs and shifts in water flow patterns. In the former sand mining areas in Telaga Biru Desert, sand mounds have emerged, rendering the land unusable due to the potential for landslides in the already damaged soil.

2) Chemical Changes

Environmental changes also manifest in chemical alterations, such as water pollution that renders water from the mining pits unsuitable for household use by residents. Similarly,

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offshore sand mining contributes to environmental pollution affecting the waters around the Riau Islands, impacting local fishermen and causing the closure of fish cages due to sea contamination. Inland sand mining also contributes to environmental pollution in terrestrial areas, given the loss of forest land and other severe impacts. Notably, a 6000-hectare area becomes unusable due to the high potential for landslides if construction is attempted in the former sand mining area.

3) Vegetation Changes

The clearing of forests around rivers for sand mining activities has a profound impact on the habitat for diverse flora and fauna. With the loss of these forests, the flora and fauna within them are at risk of disappearance. The riverine forests serve as habitats for various flora, including trees, shrubs, and undergrowth. The loss of these forests implies the potential disappearance of the diverse flora residing within them. The loss of flora can result in various negative consequences. First, in climate change, trees play a crucial role in absorbing carbon dioxide and releasing oxygen, contributing to climate regulation. The loss of trees can lead to an increase in atmospheric carbon dioxide, potentially causing climate change. Second, water quality declines. Trees are essential for maintaining water quality. With the loss of trees, water quality may decline, leading to various health issues for communities residing around the Telaga Biru Desert. Next, there is a loss of biodiversity; forests serve as homes for a wide range of flora and fauna. The loss of forests can lead to a decline in biodiversity. This reduction not only affects biodiversity but also disrupts the balance of ecosystems, potentially causing more serious issues, such as floods and droughts, in the long run.

4.2. Economic Aspect

1) Regulatory Framework for Sustainable Tourism Management

The exact revenue contributions to the national treasury from the Telaga Biru Desert tourism destination are unknown, given the absence of derivative regulations providing specific technical guidance for its management. Clearly defined rules, regulations, and policies related to the management of tourist areas like the Telaga Biru Desert are crucial for ensuring the sustainability and success of tourist destinations. Destinations such as the Telaga Biru Desert undoubtedly hold ecological and cultural value, and clear regulatory documents can help prevent overexploitation and environmental damage. Well-defined environmental regulations can aid in protecting the sustainability of the ecosystem surrounding the Telaga Biru Desert. By regulating human activities, such as infrastructure development, construction, and waste management, these documents can ensure the preservation of the natural environment.

National documents can also establish safety and security standards for tourists and visitors, encompassing safe infrastructure, emergency handling, and regulations for potentially risky activities. National documents can set policies related to taxes and economic regulations for the tourism industry. This includes tourism taxes, business permits, and rules for businesses involved in the tourism industry around the Telaga Biru Desert. Revenue from the tourism sector can significantly contribute to the national income. These documents can promote principles of sustainable tourism management, considering economic, social, and environmental aspects. Regulations may include visitation capacity limits, sustainable development, and initiatives to engage the local community. They can incorporate policies supporting the participation and empowerment of the local community in managing the tourist destination, which is crucial for maintaining a balance between economic interests and the well-

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being of the local population. Clear regulations can help prevent conflicts among stakeholders, such as landowners, local governments, industries, and the local community. Transparent regulations can create a fair and transparent framework. However, this research found that there were no derivative regulations known to the public or the wider community from the Strategic Plan of the Bintan Regency Tourism Office 2016-2021 explaining how Telaga Biru Desert is managed as a tourist destination.

2) Tourist Facilities and Infrastructure: Enhancing Economic Potential

Tourists from abroad may have different needs and expectations compared to domestic tourists. They may have specific preferences regarding facilities, services, and the tourism experience. The lack of documentation has consequences for the non-standardization of facilities and infrastructure at Telaga Biru Desert as a tourist destination. This can create discomfort for visitors and even increase security risks. Moreover, non-standardization can provide an inconsistent tourist experience, potentially harming the destination's image. Adequate and standardized facilities and infrastructure can enhance visitor comfort.

Conversely, inadequacies can hinder the tourist experience, especially for international visitors who may have higher expectations and standards. The establishment and adherence to standards for Telaga Biru Desert's facilities and infrastructure are essential for attracting and retaining tourists. It can contribute to the overall positive perception of the destination, leading to increased visitor satisfaction and repeat visits. Investing in the improvement of tourist facilities and infrastructure not only benefits the visitors but also creates economic opportunities for the local community. The development and maintenance of standardized facilities can generate employment, encourage local businesses, and contribute to the overall economic growth of the region. Furthermore, it aligns with the principles of sustainable tourism by ensuring that the destination's growth is environmentally responsible and socially beneficial.

3) The Importance of Land Zoning in Local Tourism Planning Documents

Addressing the degradation or decline in environmental quality post-mining activities requires specific interventions. The reclamation of the environment after sand mining in the Gurun Telaga Bira area, Busung Village, Bintan Regency, can be achieved through concrete and specific actions. Management, coordinated between the community and the government, should provide solutions to the current issues. Strategic steps include analyzing the current level of environmental damage, demarcating the area, and handling it through the rehabilitation of post-sand mining areas (Chevallier, 2014). Sand mining activities in the Telaga Biru Desert area, Busung Village, Bintan Regency, are no longer permitted due to licensing and resource availability issues. The government has closed sand mining in the Telaga Biru Desert area.

However, there are still post-sand mining issues, such as many areas left untreated for potential use. Currently, the government and the community, particularly the Busung Village Owned Enterprises, manage this area for tourism activities. Referring to the previously mentioned strategic steps, conducting an analysis of environmental damage and demarcating the utilization areas or, put, implementing a zoning system is crucial. Zoning the area can be done by examining several aspects, including the characteristics of the surrounding community, economic activities, the potential of the area, and the level of issues from sand mining activities. Utilization zones for post-sand mining areas can be categorized into two primary zones based on their potential and current usage. The first is the Tourism Zone, where the Telaga Biru Desert area is actively utilized and developed as a popular tourist destination visited by both

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local and international visitors. The desert and lake, formed as a result of mining activities, offer unique and picturesque landscapes that attract significant interest. To optimize economic benefits, the government should collaborate with relevant stakeholders to create a comprehensive tourism master plan, leveraging the area's potential while ensuring sustainable development. The second is the Reclamation and Conservation Zone, addressing the deep excavations left by sand mining activities since the 1980s. Through detailed studies and analyses, this abandoned mining land could be transformed into areas for cultivation, conservation of specific biota, or even the establishment of new infrastructure. These initiatives would expand the land's value beyond tourism, contributing to broader ecological and economic goals.

5. Discussion

Over-exploitation of natural resources for economic gain often comes at the expense of the environment, creating social inequality and causing ecosystem damage (Hartati, 2007; Jati, 2013). Modernity and industrialization drive intensive exploitation of natural resources. Sand mining activities in Bintan Regency reflect this paradigm, where 6,000 hectares of land have been left to deteriorate, resulting in environmental damage such as water pollution, soil degradation, and loss of biodiversity. The exploitation of natural resources in Bintan Regency demonstrates how an economic paradigm centered on over-exploitation often disregards environmental sustainability. As theorized (Hartati, 2007; Jati, 2013), such development approaches lead to significant ecosystem damage and social inequality. This study highlights that sand mining in Bintan has left critical lands with polluted water and biodiversity loss, reinforcing the damaging effects of uncontrolled resource exploitation on local communities and ecosystems.

These challenges are further exacerbated by weak governance. Armitage et al. emphasize that good governance requires transparency, public participation, and accountability (Armitage et al., 2012). In the case of Telaga Biru Desert, unclear regulations and insufficient community involvement have resulted in suboptimal post-mining management. This governance gap has not only exacerbated environmental damage but also hindered the realization of economic potential that could otherwise benefit local communities. Additionally, the transformation of the Telaga Biru Desert into a tourist destination highlights uneven economic benefits. While the area shows promise as a tourist attraction, profits remain concentrated among a few stakeholders, excluding many residents. The absence of equitable benefit-sharing mechanisms often turns what should be a blessing into an economic curse for local populations (Karl, 1997; Nwonwu, 2016).

The economic significance of sand mining extends beyond local contexts. Sand is the second most consumed natural resource globally, following freshwater, driven by an insatiable appetite for development and construction projects (Gavriletea, 2017). Regions like the Asia-Pacific, Europe, and North America exhibit the highest sand dredging rates (GESAMP, 2019). Singapore, as the largest importer of sand, has relied heavily on neighboring countries like Indonesia to support its reclamation projects. Over the past two decades, Singapore has imported over 517 million tonnes of sand, with projected demand reaching 4 billion cubic meters by 2030. This heavy reliance underscores the strategic importance of Indonesia's sand resources, particularly from the Riau Islands, given their superior quality, proximity, and cost-effectiveness compared to other sources in Southeast Asia.

Historically, Indonesia's sea sand exports were a significant economic activity, generating substantial revenue for the country. However, the lack of regulation and oversight led to

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widespread illegal mining operations, causing severe damage to marine and coastal ecosystems, threatening the livelihoods of local communities, and disproportionately benefiting foreign economies at Indonesia's expense. On a global scale, unregulated sand mining affects over 70 countries, contributing to widespread environmental degradation, loss of biodiversity, and increasing economic disparities between nations (Koehnken et al., 2020).

From a social theory perspective, the developmentalism paradigm, rooted in modernization theories by scholars such as Max Weber, W.W. Rostow, and David McClelland, advocates for investment-driven growth as a solution to poverty and underdevelopment. This approach assumes that industrialization and resource extraction are necessary steps toward economic progress. However, in practice, this paradigm often prioritizes extractive industries over sustainable resource management, leading to the depletion of natural resources, environmental degradation, and worsening social inequalities. Such outcomes highlight the critical need for a balanced approach that integrates environmental sustainability with economic development to mitigate these crises.

The findings of this study reveal significant environmental, economic, and social impacts of sand mining in Bintan Regency. Environmentally, the destruction of 6,000 hectares of land has left it unsuitable for use due to landslide risks and water pollution. The loss of forest cover in mining areas has further degraded biodiversity and heightened climate risks by reducing carbon-sequestering capacity. Economically, while Telaga Biru Desert has potential as a tourist destination, the lack of clear regulations and standardized facilities hinders the full optimization of this potential. Socially, sand mining has displaced traditional livelihoods such as agriculture and plantations, forcing residents to seek informal employment or migrate. These disruptions have also led to unequal economic benefits and increased social tensions due to limited community involvement in decision-making.

Residents living near Telaga Biru Desert have voiced their dissatisfaction with the impacts of sand mining activities. They noted that the destruction of forests and sand dredging had forced them to abandon their traditional livelihoods, such as farming, and instead work as traders in the Telaga Biru Desert. Additionally, the decline in water quality has compelled them to purchase clean water frequently, further straining their resources. This testimony underscores the broader social and environmental challenges faced by local communities. Governance challenges in post-mining management include vague regulations and insufficient community engagement. Current regulations governing the Telaga Biru Desert lack specific technical guidelines for sustainable tourism development. Addressing these gaps requires developing a detailed tourism master plan and establishing a zoning system to allocate areas for conservation, tourism, and community activities. Strengthening community participation through capacity-building programs and partnerships is critical to ensure equitable distribution of benefits and long-term sustainability. Additionally, the local government must take firm action against illegal land sand sales, which have persisted due to weak enforcement and have become an alternative livelihood for some residents but are contributing to environmental degradation.

6. Conclusion

This research reveals the significant impact of land sand mining activities in Bintan Regency, Riau Islands, especially in Busung Village, Seri Kuala Lobam District. The sand mining activities result in changes to the landscape, environmental damage, and the loss of forest land, affecting the overall flora, fauna, and ecosystem. The implications of land sand mining encompass both environmental and economic aspects. Environmentally, changes in

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topography, cliffs, and water pollution are tangible consequences of mining activities. The loss of forest land also leads to a decline in water quality, loss of biodiversity, and disruptions to the ecosystem.

Additionally, the Telaga Biru Desert, which emerged as a tourist attraction after mining, still harbors negative impacts that need attention, such as the potential for landslides and environmental unsustainability. In economic terms, the Telaga Biru Desert tourist destination provides a positive contribution, but adequate regulations and policies for its management are lacking. Clear rules and their enforcement are essential for achieving environmental sustainability and empowering the local community. Sustainable governance strategies include (1) Developing a zoning framework for post-mining areas to balance conservation, tourism, and community activities; (2) Formulating and enforcing detailed technical guidelines for post-mining area management, prioritizing environmental restoration; (3) Promoting eco-tourism initiatives that involve local communities as key stakeholders; and (4) Implementing monitoring mechanisms to ensure compliance with sustainability goals. Future research should explore the long-term ecological recovery of post-mining areas and comparative studies of similar initiatives in other regions. Also, sustainable management requires coordination among the government, the tourism industry, and the local community.

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The authors have declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

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