

A Strategy for preventing coastal degradation due to mangrove logging on the coast of Bintan Island, Indonesia to prevent shallowing of the strait by applying international principles: The common heritage of mankind

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Abstract. Mangroves are important as a green belt for coastal areas. Mangrove logging is causing coastal degradation due to logging mangroves for land clearing. This study employs a qualitative and empirical legal method to analyze the issues that need addressing in this study on law enforcement in preventing coastal degradation caused by mangrove cutting in coastal Bintan, Indonesia, to prevent siltation of waters and straits through the application of the principle of the common heritage of mankind, so that marine and coastal sustainability can be realised. From the national data, the distribution of mangrove forests in Riau Islands Province is 68,417 ha, 37.000 hectares have been damaged, and at least 37 thousand ha have been destroyed. In addition, mangrove degradation, including logging, leads to problems of sea silt, which can negatively impact upstream agriculture and estuarine agriculture. The principle of shared heritage of mankind must be implemented in the mangrove region. Therefore, coastal mangrove must be conserved in order to prevent destruction and the shallowing of the sea or strait.

1 Introduction

While land is dissolving, forests are vanishing, numerous species are threatened with extinction, clean water sources are depleting, fisheries are failing, and pollution is endangering human health, the human population is rising geometrically. In the pursuit of economic growth, society has neglected the quality of the environment and the natural resources on which people depend. In the process of improving living standards, people should not damage the environment and disrupt the sustainability of natural resources, which is contrary to their long-term interests. The destruction of ecosystems due to human greed can be seen in the degradation of the environment. The state of Indonesia's mangrove forests is currently declining [1].

The decline in mangrove forest area is not unjustified; rather, it is a result of overwhelming development that is now focused on the coastal regions of Riau Islands Province. This has led to an escalating threat to the existence of these forests, which is compounded by logging activities and hoarding of mangrove land. Such activities are undertaken for land clearance purposes by property developers. Mangrove forests enjoy legal recognition under international law for the purpose of safeguarding and managing their ecosystems. Such recognition is enshrined in various conventions including the The United Nations Conference on Environment and Development (UNCED 1992), World Heritage Convention, International Convention on Wetlands, and Convention on Biological Diversity. Meanwhile, the management of the Indonesia national mangrove ecosystem is regulated by Legal No. 27 Years 2007 as amended by Legal No. 1 of 2014 on the Management of Coastal Areas and Small Islands.

Overall, the distribution of mangrove forests worldwide based on data from the Ministry of Maritime Affairs and Fisheries is 16,530,000 Ha. Where, of the total data, almost a quarter of the distribution of mangrove forests is in Indonesia, covering 3,490,000 Ha or 21% of the world's mangroves [2]. Based on the Ministry of Environment and Forestry's 2021 Map of National Mangroves in Indonesia are 3,364,076 Ha. According to official statistics, the total area of mangrove forests in Riau Islands Province is 68,417 hectares [3]. Of the entire distribution of mangrove forests in Riau Islands Province, at least 37 thousand ha of mangrove forests have been damaged. The amount of damage data is certainly very astonishing, where the damage to the mangrove forest area in Riau Islands Province has exceeded half (55 per cent) of the total distribution of existing mangrove forests. One of the most affected mangrove forest areas is located on Bintan Island [4].

Geographically, Bintan Island is almost 2/3 of its area surrounded by coastal areas. Where, along the coastline there are mangrove forests. The landscape consists of highlands, lowlands, swamps, and watersheds. The areas that are

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lowlands, swamps, and watersheds are all lush mangrove forests [5]. Mangrove [6]. Mangroves are one of the ecosystems that characterise the island of Bintan with its hilly contours and bauxite deposits. The nature of the island, where 2/3 (two thirds) of the area is surrounded by the coastline, means that there is limited land available for development, so land use tends to move towards the coast, threatening the existence of the mangroves. The endangered mangrove ecosystem is a plant that provides many benefits to human life, such as attenuating waves and storm winds for the area behind it, protecting the coast from abrasion, tidal waves (rob), tsunamis, retaining silt and trapping sediment carried by surface water flow, preventing seawater intrusion into the land and, within certain limits, can be a neutraliser of water pollution [7].

Mangroves can exert control over the intrusion of seawater through several mechanisms. These include preventing CaCO₃ deposition by root exudate bodies, reducing salt content via organic matter from litter decomposition, limiting the reach of tidal water to land via the physical role of mangrove root structures, and improving soil physical and chemical properties. Mangrove density contributes to accretion extent, sediment distribution and sea level elevation [8]. Mangrove forests are important as a green belt for coastal areas. Especially on the island of Bintan. Mangroves have many physical, economic, socio-cultural and environmental functions for communities and coastal areas.

Mangrove degradation, such as cutting, can cause sea siltation issues, particularly in the straits. Upstream agriculture and estuarine agriculture are ecologically dependent. Coral reefs, mangroves, and seaweed health are interconnected. Illegal fishing activities may harm coral reefs. The harm to coral reefs and mangroves can negatively impact fisheries. Collaboration between forestry and fisheries agencies can offer a viable solution by implementing forestry practices that mitigate the amount of erosion and sedimentation in rivers that merge into lagoons, estuaries, and reefs [9]. Damage to the mangrove ecosystem affects environmental degradation as also occurs based on the state of the art or previous research. such as research on mangrove damage which affects environmental degradation in East Java and research that has also been carried out in Douala Cameroon [10,11].

Based on current conditions, the Bintan coastline is part of the Indonesian maritime waters and the Singapore Strait Littoral State. There are also user states over the Strait. The Straits of Malacca and Singapore provide access to international trade from the West to East Asia and vice-versa and area serves as an international sea lane. As a result, the area is quite busy. Today, the Straits of Malacca and Singapore (SOMS) is one of the busiest shipping lanes in the world. One third of the world's trade passes through the Strait [11, 12]. Projections indicate a noteworthy rise in maritime trade in the region, which has become a focal area for economic development. Bintan Island, comprising Tanjung Pinang City and Bintan Regency, lies within the Singapore, Johor, Riau (SIJORI) growth triangle, an area of development encompassing Singapore, Johor, and Riau/Riau Islands. As a coastal region, it holds significant potential for growth and expansion [14]. The cooperation aims to accelerate economic growth and facilitate the flow of trade, investment and tourism. For example, the mangrove logging case in 2018 was carried out to prepare the construction of the Tanjungpinang City Cultural Tourism Park. Furthermore, the mangrove logging case that occurred in 2023 in Tokojo, East Bintan. As follows.



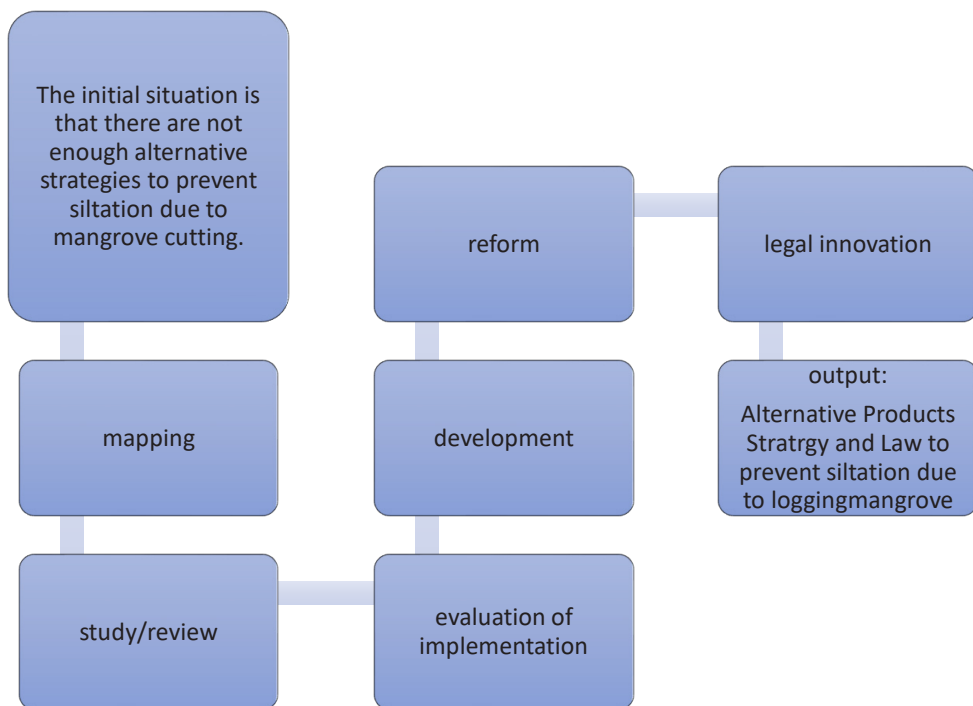
Fig. 1. Mangrove Logging (Mangrove logging that occurred in 2023 in Tokojo, East Bintan based on Batam Today.com, <http://m.batamtoday.com/berita187547-Izin-Belum-Keluar,-Mangrove-di-Tokojo-Bintan-Sudah-Dibabat.html>, diakses pada 27 Maret 2023, Pukul 00.01 WIB)

Therefore, a strategy to stop mangrove logging needs to be implemented because it can have an impact on strait sedimentation. Apart from that, mangroves have many important functions. In this case, Bintan, Indonesia is a coastal state of the Straits of Malacca and Singapore, and many other countries use these waters. In the end, shallowing causes many problems at sea, such as ships running aground. If this continues it will have a negative impact on the economy. To overcome this problem, it is necessary to apply international principles, namely the principle of the common heritage of

mankind in mangrove areas. In addition, it is important to review Indonesia's national laws and regulations regarding the felling of mangrove forests.

2 Method

This research employs a qualitative with empirical legal technique. Law research is the study of the efficient marshalling of authorities bearing on a legal issue [14]. Primary and secondary data were used in this investigation [15, 16]. In general, for empirical legal research, the available methods of approach include laws and regulations related to what happens based on facts, which means comprehending the actual circumstances of the study site by investigating all relevant rules and regulations [17]. To analyze the issues that need addressing in this study on law enforcement in preventing coastal degradation caused by mangrove logging in coastal Bintan, Indonesia to prevent siltation of waters and straits through the application of the principle of the common heritage of mankind to achieve marine and coastal sustainability, a number of coordinated activities must be implemented. The following stages are undertaken to address the problems encountered in developing solutions:



This study's data was acquired through field research and reading. The two types of data acquired are primary data and secondary data. There are three sorts of legal resources in secondary data: primary, secondary, and tertiary legal information. Interview guidelines, tape recorders, and cameras were employed as data gathering methods. There are two types of data gathering procedures: primary and secondary data collection techniques. When doing empirical research with observations and interviews as data gathering instruments, researchers employ primary data. In this study, secondary data collection strategies included literature studies, subscription, free, and print resources, and Focus Group Discussion (FGD).

3 Result and Discussion

Since the late 19th century, Human activities has resulted in the widespread destruction of mangrove forests. As a result, this degradation has had an identifiable impact on humanity. For instance, in Southeast Asia, the clearance of mangrove areas near the open sea has worsened coastal erosion caused by waves. Mangrove forests lining tropical coastlines are vital, providing not only local resources such as timber and food but also global environmental benefits. These ecosystems offer crucial protection against land erosion and are essential for the health and stability of the earth's ecosystem [18]. Mangroves are an important and vital ecology. They act as sediment traps, protecting coral reefs from damage. The

mangrove habitat is ideal for fish breeding. The locals harvest food, lumber, and charcoal from the mangrove forests. There is evidence of mangrove ecosystem damage and fragmentation. This devastation is caused by severe cutting, pollution, and human activity [19]. The logging of mangrove forests that occurs is also based on the Timber Forest Product Utilisation Business Permit that has been pocketed by the Company. Before logging the mangrove forest, the Government first prepares a logging plan and timber cruising conducted by the Supervisor of Technical Personnel for Sustainable Production Forest Management Forest Planning and conducts an inventory of stands as a basis for payment of Forest Resources Provision and Reforestation Fund. The preparation of the logging plan is carried out with 100% (one hundred per cent) intensity. This means that all tree stands in the land area are measured and recorded by felling. For example, based on the logging plan document in Sei Carang, with a logging area of 2.8 Ha, timber cruising was carried out as follows.



Fig. 2. Mangrove deforestation undertaken in 2019, logging and timber cruising based on Dinas Lingkungan Hidup Kota Tanjungpinang)

From the inventory of naturally growing tree stands on the land, the potential trees in the area are mangrove species or mangroves as many as 356 stems equal to 7.49 M³, Gopasa species as many as 5 stems equal to 0.09 M³, nyirih species as many as 26 stems equal to 1.82 M³, and Mixed Forest species as many as 215 stems equal to 16.31 M³. The total number was 602 stems, equal to 25.71 M³. The inventory of stands by logging and measuring was carried out as the basis for payment of Forest Resources Provision and Reforestation Fund.

According to the Ministry of Environment and Forestry's 2021 National Mangrove Map, mangrove forests in Indonesia are 3,364,076 ha. From this national data, the total area of mangrove forests in Riau Islands Province is 68,417 ha. Of the entire distribution of mangrove forests in Riau Islands Province, at least 37 thousand ha of mangrove forests have been damaged. The amount of damage data is certainly very astonishing, where the damage to the mangrove forest area in Riau Islands Province has exceeded half (55 per cent) of the total distribution of existing mangrove forests. One of the most affected mangrove forest areas is located on Bintan Island.

Mangrove degradation, including mangrove cutting, will lead to problems of sea siltation, including in the straits. Ecologically, upstream agriculture and estuarine agriculture are interdependent. The health of coral reefs, mangroves and

seaweed is interlinked. Illegal fishing can damage coral reefs. Damage to coral reefs and mangroves also reduces fisheries. Consultation between forestry and fisheries agencies can provide a way forward through forestry practices that can reduce the amount of erosion and sedimentation in rivers flowing into lagoons, estuaries and reefs.[9] mangrove logging that causes mangrove destruction leads to coastal erosion.[18] Siltation of coastal waters due to sediment deposition that before the mangrove forest was converted was deposited in the mangrove forest.[20]

The shallowing will also have a negative impact on the mangrove itself. Siltation is a key cause of mangrove ecosystem loss. High siltation suspends huge particles, which cover and suffocate the roots, causing oxygen deficiency and possibly tree death. Water and oxygen stress were imposed by siltation. Mangroves adapted to siltation through morphological and physiological changes. Mangrove plants have anatomical modifications, such as fewer stomata and leaves. Some adaptations, however, are species specific. As a result, siltation has a negative impact on mangroves, and the trees will modify their morphological and physiological properties. This review paper discusses the morphological and physiological adaptations of mangrove plants to siltation [19].

The cutting of mangroves must be halted because it will cause the strait to silt up. Furthermore, mangroves provide several roles. Bintan, Indonesia is the part of littoral state of the Malacca and Singapore strait, there are several user states in these seas. When siltation happens, it causes several issues at sea, such as ships going aground, and if it persists, it has an economic impact. So, in order to achieve marine and coastal sustainability, the principle of shared heritage of mankind must be implemented in the mangrove region. The Bintan Coast, part of Indonesian marine and the Littoral State of the Singapore Strait, is an international shipping route that connects the Strait of Malacca and the Singapore Strait. It is a dense location with a third of the world's traded goods passing through the strait. Projections indicate a significant increase in maritime trade and economic development in the region. Bintan Island, a coastal region, is part of the Development Growth Triangle between Singapore, Johor, and Riau/Riau Islands [11, 12, 13, 21]. As well as the need to conduct a review of the national law of the State of Indonesia relating to Mangrove logging as described above.

Mangroves are linked to the sea as mentioned above. When there is siltation of the sea due to land degradation due to mangrove logging, it certainly damages the sea. Stockholm Declaration 1972 [22]. The human right to a decent and healthy environment is discussed. The declaration also obligates mankind to preserve their environment as much as possible so that future generations can enjoy it. The marine environment is a shared property of humanity that is prone to environmental contamination. Pollution in the marine or ocean environment has a negative influence on many different aspects of human existence. Thus, maritime pollution has repercussions, especially the notion that countries require global and regional collaboration to reduce the threat of environmental degradation.

As a result of this forest destruction, many people in Indonesia and other developing countries have proposed the concept of community-based forest management [23]. In addition to this notion, the principle of mankind's shared inheritance should be used. Mangroves are protected by the World Heritage Convention, the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat Convention (RAMSAR), and the Man and the Biosphere (MAB) programme, three international agreements related to the conservation of mangrove systems [24]. Furthermore, the Rio Earth Summit (1992) declared mangroves to be part of humanity's shared heritage in Agenda 21. The need to protect these ecosystems, which are essential for preserving terrestrial and marine biodiversity, justifies making mangroves part of the legacy, or common heritage [25]. So that mangroves are not only related to land but also to the sea. As a result, it is critical that mangroves along the shore be protected so that they are not chopped down and cause the sea or strait to become shallower. As a result, it must be reiterated in mangrove conservation rules at the international, regional, and national levels. States should cooperate to further develop international law on liability and compensation for victims of pollution and other environmental damage caused by activities within the State's jurisdiction or control over areas outside its jurisdiction, as stated in the Principles of Cooperation under Principle 22 of Stockholm. International environmental conservation and enhancement issues should be addressed cooperatively by all on an equal footing, huge and little. Cooperation via multilateral or bilateral agreements, or other acceptable means, is essential to properly manage, avoid, ameliorate, and remove negative environmental repercussions from all activities while respecting the sovereignty and interests of all States.

4 Conclusion

Mangrove forests have been globally destroyed since the late 19th century due to human activity, causing significant damage to the environment and human life. These ecosystems provide local resources like timber and food, as well as global environmental benefits. They function as sediment traps, protecting coral reefs from destruction and providing excellent fish nurseries. However, mangrove degradation, including logging, leads to problems of sea siltation, which can negatively impact upstream agriculture and estuarine agriculture. In Indonesia, at least 37 thousand hectares of mangrove forests have been damaged, with one of the most affected areas being Bintan Island. This degradation leads to sea siltation, which can cause problems at sea, such as ship running aground, and have an economic impact. To achieve marine and coastal sustainability, it is necessary to put the principle of common heritage in the mangrove area. Mangroves are linked to the sea, and land degradation due to mangrove logging damages the sea. The human right to a safe and healthy environment is emphasised Stockholm 1972, and the maritime environment is sensitive to possible environmental contamination. To reduce the problem of environmental contamination, governments must work together at the global and regional levels. Mangroves are protected by international treaties such as World Heritage Convention, RAMSAR, and the Man and the Biosphere (MAB) initiative. Agenda 21 at the Rio Earth Summit (1992) classified them as part of

humanity's shared heritage. As a result, coastal mangroves must be conserved in order to prevent destruction and the shallowing of the sea or strait. International, regional, and national regulations concerning mangrove protection should be reaffirmed as mankind's common heritage, and international issues, environmental protection and improvement should be addressed cooperatively and on an equal footing by all states, large and small.

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