

## COLLABORATION ON DEVELOPMENT PLANNING POLICY: MITIGATION OF ABRASION PREVENTION IN SIAK REGENCY (CASE STUDY OF MENGKAPAN VILLAGE)

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### ABSTRACT

Siak Regency, located in Riau Province, is one of the areas facing a serious threat of abrasion, especially in coastal areas bordering the Lolang Strait. Mengkapan Village, one of the coastal villages in Siak Regency, has been significantly affected by abrasion. Based on initial observations, the abrasion rate in this area is 2-5 m per year, which poses a threat. Development planning policies play a crucial role in addressing the abrasion phenomenon in Mengkapan Village, Siak Regency, Riau Province. With good planning, development will align with community expectations. Based on satellite imagery analyses in 2020 and 2025, Mengkapan Village experienced abrasion at a rate of 6.43 m/year. Development planning policies in coastal abrasion mitigation must be an integral part of a sustainable regional development strategy. Through a combination of structural, non-structural, and collaborative approaches, along with strong policy support, coastal abrasion can be minimized. Synergy among the government, community, business world, and academia are key to realizing a resilient, productive, and sustainable coastline for future generations.

**Keywords:** Abrasion, Changes in the Coastline, Policy, Coast

### 1. INTRODUCTION

Indonesia, as an archipelagic country with the second-longest coastline in the world, faces various challenges in coastal area management. One of the main challenges is coastal abrasion or erosion, which occurs due to wave activity, ocean currents, and anthropogenic factors<sup>1</sup>. The phenomenon of coastal abrasion or erosion is very disruptive and detrimental to the community. Many residential areas, agricultural land, and other infrastructure are submerged.

The Regional and Central Governments consider it necessary to take

policy steps to provide good public services (good governance) to their communities. Public policy, in a substantive framework, is all the activities carried out by the government to solve the public problems<sup>2</sup>.

Siak Regency, located in Riau Province, is one of the areas facing a serious threat of abrasion, particularly in coastal areas bordering the Lolang Strait. Mengkapan Village, one of the coastal villages in Siak Regency, has been significantly affected by abrasion. Based on initial observations, the abrasion rate in this area reaches 2-5 m per year, threatening residential areas, infrastructure, and local

livelihoods. This situation requires comprehensive, sustainable government efforts that involve the active participation of the local community.

Development planning policies play an important role in addressing the abrasion phenomenon in Mengkapan Village, Siak Regency, Riau Province. With good planning, development will align with community expectations. Development is an effort carried out by an individual, several individuals, an organization, or a nation or state aimed at improving the quality of life by preventing poverty or marginalization<sup>3</sup>. Development cannot be carried out by the government alone, but needs to involve the community (community empowerment) and collaborate with related parties (stakeholders), including the private sector.

Community empowerment in the context of coastal environmental management has proven effective in various cases in Indonesia<sup>2,3</sup>. This approach not only focuses on the technical aspects of abrasion management but also involves social, economic, cultural, and institutional dimensions that can strengthen community resilience to environmental changes.

## 2. RESEARCH METHOD

### Time and Place

This research was conducted from July to November 2025. The research was carried out in Mengkapan Village, Sungai Apit District, Siak Regency, Riau Province.

### Method

This research uses a qualitative case study approach. This approach was chosen because it enables researchers to gain a deep, comprehensive understanding of community phenomena within the specific context of abrasion prevention in Mengkapan Village. The research informants were selected using purposive sampling for key informants and snowball sampling to expand the informant network as needed. The research population included development policy stakeholders in Siak Regency, the Mengkapan Village

community, and practitioners and academics involved in abrasion mitigation. Primary data collection was conducted through semi-structured in-depth interviews with informants.

### Procedures

The initial stage of this research is to identify relevant literature. For the analysis of shoreline changes the first stage is to download the Landsat Band 5 satellite imagery of 2020 and 2025, then analyzed using ArcGIS software by digitizing each image stored in a special format, namely feature class which is stored in special storage, namely personal geodatabase so that it can be calculated using the Digital Shoreline Analysis System (DSAS) tools so that the rate of shoreline change can be obtained, after the analysis is completed it is poured into the form of a shoreline change map.

Community perceptions as data for policy strategies were collected through interviews conducted in Mengkapan Village, Siak Regency, with village officials and coastal residents.

## 3. RESULT AND DISCUSSION

### Coastline Changes

The analysis of satellite imagery from 2020 and 2025 found that the coastal side of Mengkapan Village had a 100% abrasion rate, with an average abrasion rate of 6.43 m/year and a maximum abrasion distance of 11.89 m. Based on research conducted by Saraswati et al.<sup>4</sup> from 2000 to 2010, there was a reduction of 2.45 km in the coastline, while from 2010 to 2020.

The coastline length increased by 0.32 km. Therefore, it can be concluded that Siak Regency experienced more coastline reduction than increase. In general, this abrasion is caused by the loss of coastal vegetation, namely mangroves. Furthermore, abrasion also occurs due to increased shipping volume in the region. An overview of the analysis of changes in the coastline is shown in Figure 1.

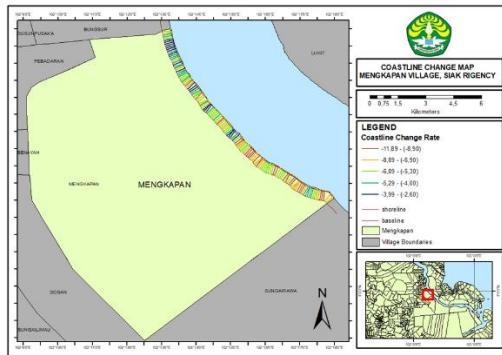


Figure 1. Analysis of coastline changes

### Collaboration in Coastal Abrasion Mitigation

The Siak Regency Government and the Mengkapan Village Government act as coordinators and policymakers, creating coastal spatial planning policies that regulate coastal protection zones, mangrove



replanting, and the development of environmentally friendly infrastructure, in the form of Regional Regulations, Regent Decrees, Village Regulations, and so on. Data obtained from field interviews (Figure 2).



Figure 2. Interview and survey activities directly observed the conditions in the coastal area of Mengkapan Village.

Based on interviews conducted, there are no policies or regulations governing abrasion mitigation at either the village or regional government levels in Mengkapan Village. What exists is the Regional Regulation (Perda) Number 4 of 2022 of Siak Regency concerning "Green Siak". This Regional Regulation serves as a reference for implementing the "Green Siak" program, which aims to protect the

environment and reduce greenhouse gas emissions, and to support the principles of the Sustainable Development Goals (SDGs). The primary focus of the Green Siak Regional Regulation includes sustainable forest and peatland management, prevention and handling of forest and land fires, integrated waste management, sustainable management of oil palm plantations, reduction of pollution of the Siak River, and

resolution of land conflicts as a basis and legal umbrella.

Then, based on interviews in the field, this happened because the issue of coastal abrasion in Mengkapan Village in the 2021-2026 Siak Regency RPJMD has not become a strategic issue, only a local issue; however, the Siak Regency Regional Government, through the Public Works Department in the 2024 APBD, has taken the policy of building gabions in Mengkapan Village along 233 m for community-based mitigation activities, such as mangrove forest rehabilitation and coastal greenway development.

The Mengkapan Village community, in general, and the coastal community in particular, must play an active role in preserving the coastal environment. Abrasion mitigation programs will be more successful if the community is actively involved in planning, implementation, and monitoring, because the community knows its needs and resource potential. For example, the community can play a role in making plans, jointly planting mangroves, and evaluating and monitoring mangrove forests for damage. Community empowerment is the process of increasingly creating a harmonious relationship between community needs and potential, resources, and opportunities<sup>5</sup>. Thus, the success of abrasion mitigation is primarily determined by the active role of an empowered community.

The interview results indicated that private-sector companies operating in Siak Regency, such as PT. Bumi Siak Pusako, PT. Riau Pulp and Paper (RAPP), PT. Samudra Siak, PT. KITB, especially companies operating in the coastal area of Kepenghuluan Kampung Mengkapan, such as the oil industry (PT. Imbang Tata Alam, a subsidiary of PT. Energi Mega Persada), have social responsibility through CSR (corporate social responsibility) funds to support coastal conservation activities. Based on interviews and field observations by researchers, PT. Imbang Tata Alam, a subsidiary of PT. Energi Mega Persada has cared about coastal abrasion, such as

fostering and facilitating the Nature School in Kayu Ara Permai Village, as well as facilitating and carrying out mangrove planting.

Then, it also succeeded in bringing an international Non-Governmental Organization (NGO) to visit the Historic River Mangrove (MSB) conservation area. Participants came from nine countries worldwide, including the Netherlands, France, England, and Brazil. During this visit, a sharing session and a joint mangrove planting were also held. This visit was part of the "Landscape Exchange Week" program, which aims to learn about villages through collaboration and environmental conservation activities. Mangroves in the MSB area not only prevent abrasion but also create economic opportunities through ecotourism and help maintain the ecosystem, thereby increasing fishermen's catches.



**Figure 3.** Visit by international NGOs  
(source: Media Cakra 89)

NGOs (Non-Governmental Organizations) can play a role in community assistance, such as environmental education, mangrove planting, and monitoring coastal rehabilitation programs. Educational assistance, such as that provided to elementary school students, junior high school students, and the community, is carried out at the Teras Mangrove Sungai Bersejarah Meeting Hall (Assistance from PT. RAPP through the CSR program) called the Kampung Kayu Ara Permai Nature School, Sungai Apit, Siak District, which is held on the morning of school holidays. This has many benefits, namely instilling in

students from an early age a love of nature, protecting and preserving mangrove forests, and providing students and the community



**Figure 4.** Increasing community capacity in mitigating abrasion disasters

Cross-sector collaboration is needed to develop an integrated coastal area governance policy (ICZM, Integrated Coastal Zone Management). This approach emphasizes the importance of synergy and the integration of all stakeholders for abrasion mitigation and sustainable environmental conservation, thereby improving community welfare, with this synergy and integration, abrasion mitigation activities do not run in part, but become a comprehensive and massive part of achieving sustainable development goals for the coastal area of Kepenghulan Kampung Mengkapan.

Then, collaboration is not just a form of technical cooperation, but a strategic effort to build collective awareness about the importance of maintaining coastal ecosystems, because the success of mitigation is determined mainly by the synergy between the government, community, private sector (business), academics, NGOs, and communities (civil society organizations). With strong, sustainable collaboration, coastal abrasion in Kepenghulan Kampung Mengkapan can be

overcome, the coastal environmental ecosystem can be protected, the community's economy can be improved, and coastal communities can prosper.

According to Saleh<sup>2</sup>, collaboration is the pooling of energy and increased capabilities utilized to achieve mutually agreed goals. Collaboration is a necessity in facing complexity and limited resources. Rahardjo<sup>6</sup> states that collaboration is a concept of relationships among organizations, governments, strategic alliances, and multi-organizational networks to manage shared resources, which are difficult to achieve alone.

In the context of strengthening community capacity to mitigate abrasion disasters in Mengkapan Village, Sungai Apit District, Siak Regency, Riau Province, it can be observed that there has been strong collaboration among the Mengkapan Village Government, the Mangrove Ecotourism Management Group of Mengkapan Village, the Siak Regency Government, and PT. Imbang Tata Alam, a subsidiary of PT. Energi Mega Persada, PT. Riau Pulp and

Paper (RAPP), PT. Samudra Siak, and PT. KITB, although not yet optimal.



**Figure 5.** The role of each stakeholder in strengthening community capacity in mitigating abrasion disasters in Mengkapan village, Sungai Apit sub-district, Siak district, Riau Province

### Development Planning Policy in Coastal Abrasion Mitigation

Coastal abrasion is caused by a combination of natural factors and human activities, such as mangrove cutting and infrastructure development without environmental studies, as well as ocean waves and climate change that trigger sea level rise. Therefore, optimal development planning policies are needed with projections and are oriented towards sustainable coastal abrasion mitigation. According to Makmur<sup>1</sup>, Policies always begin with thoughts about their preparation, formulation, implementation, or evaluation. All of these activities require various rational and objective considerations to ensure justice.

The development planning policy is a legal instrument that serves as a guideline for addressing abrasion in Mengkapan Village and provides a basis for influencing and pressuring stakeholders to collaborate and synergize with the community. Policy is indeed a powerful area that can influence and exert pressure on various parties<sup>7</sup>. The existence of a policy can serve as justification for influencing and pressuring relevant parties to address abrasion and serve as a legal preservation measure.

A good development planning policy is a manifestation of the goals and objectives to be achieved. According to Makmur<sup>1</sup>, the goals and objectives of a policy are to be

achieved, expressed in concrete terms as a guideline for realizing them. Thus, there is a correlation and tendency between development planning policies and development objectives, so every development planning policy must have its purpose. Likewise, the abrasion mitigation development planning policy in Kampung Mengkapan aims to prevent and mitigate abrasion, ensuring the continuity of a safe, peaceful, and prosperous community life. This aligns with what Zaili<sup>8</sup> said: Sustainable Development is a development effort that includes economic, social, environmental, and even cultural aspects to meet the needs of future generations. In fact, this nature is a legacy for our children and grandchildren; for that reason, it must be protected and maintained for its sustainability.

Development planning policies in coastal abrasion mitigation must be based on the principles of sustainable development and integrated coastal zone management (ICZM). This requires policy regulations, both from the Central Government, the Provincial Government, the Regency Government, and the Mengkapan Village Government. These policy regulations serve as the basis for the Siak Regency Government and the Mengkapan Village Headquarters to prepare a Coastal Zone Development Plan focused on abrasion prevention and mitigation, despite the

absence of specific regulations on the subject.

### **Development Planning Strategy**

The development of prevention and the overcoming of abrasion in Kampung Mengkapan must be comprehensive, massive, simultaneous, and sustainable. It must be properly followed up, as nature continues to evolve due to human activities that are not unlimited. Human intervention in nature began with the industrial revolution, exploration and expeditions to find a new world (Mundus Novus and a new lift to seek wealth (Gold), glory (Glory), and the mission of spreading religion (Gospel) causing changes in nature and the environment that are so massive and instantaneous that they affect the evolutionary process throughout the planet Earth.

In the context of the development policy, mitigation of abrasion prevention in Kampung Mengkapan can be implemented through three strategic approaches:

#### **Structural Approach**

Through physical development to restrain the rate of abrasion, such as: Construction of environmentally friendly breakwaters, revetments, or sea walls; creation of vegetation-based coastal belts; mangrove rehabilitation and restoration as a natural wave barrier

This approach requires thorough technical planning and strategic environmental studies (KLHS) with academics and experts in their fields to ensure the ecosystem's success and sustainability without reducing the community's rights to live and prosper.

#### **Non-Structural Approach**

In the form of spatial planning policies, zoning regulations, and community education and empowerment. The government needs to regulate: a coastal protection zone of at least 100 m from the highest tide; a prohibition on permanent construction in areas prone to abrasion; a

coastal community education program on coastal conservation and an environmentally friendly alternative economy; the relocation of community settlements; and the introduction of new opportunities and jobs, besides fishing.

#### **Collaborative Approach**

Development planning policies need to integrate the roles of all stakeholders: government, communities, academics, the private sector, and non-governmental organizations. This synergy will strengthen the implementation of rehabilitation programs, as well as supervision, monitoring, and evaluation of the sustainable management of the Kampung Mengkapan coastline.

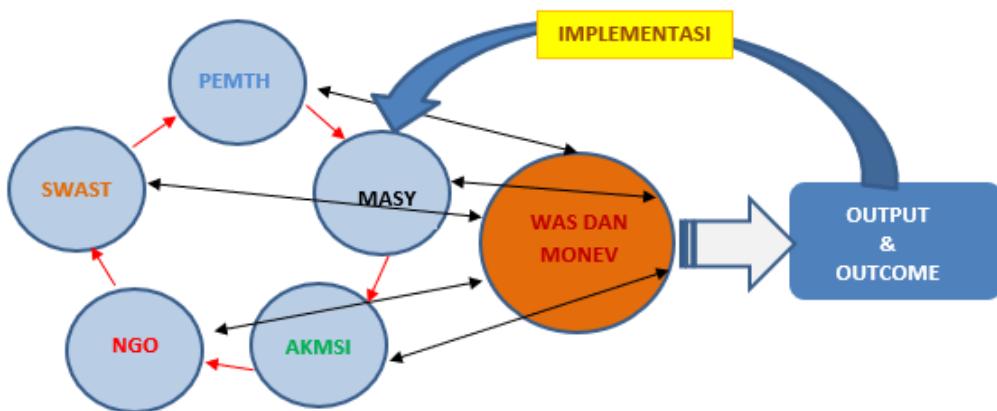
#### **Implementation in Regional Development**

Regional governments can implement abrasion mitigation policies through several development instruments, such as environmentally based budgeting (Green Budgeting) in the APBD; the resilient coastal village program through Village Funds; collaboration with universities for research and monitoring of coastline changes; and the utilization of corporate CSR funds for mangrove rehabilitation and development of natural coastal belts.

In addition, development planning must take into account the social, economic, and environmental dimensions of coastal communities, so that policies are not only oriented towards infrastructure but also towards community welfare. Sustainable coastal development must integrate economic, social, and ecological aspects in a balanced manner to provide short, medium, and long-term benefits to local communities<sup>9</sup>. This means that development aims to improve community welfare by empowering them. Community empowerment is the process of increasing community capacity to respond to various emerging issues<sup>5</sup>. Therefore, empowering the Mengkapan Village community is an important component, alongside physical development, to address abrasion.

Mengkapan Village Beach, Sungai Apit District, Siak Regency, Riau Province, needs sustainable abrasion prevention and mitigation, with strategic policies grounded in community empowerment. The policies focus on (1) Strengthening regulations, (2) Strengthening institutions and community capacity, (3) Construction of gabions, breakwater, and revetment, (4) Mangrove nursery and planting, (5) Research and Studies, (6) Education and Training (6)

TAKE Program, (7) NGO, (8) Budget support from Village APBD, District APBD, Provincial APBD, as well as APBN and Private Parties, (9) Supervision, Monitoring and Evaluation. With a strategic policy approach, it is hoped that the Mengkapan Village community will not only be beneficiaries but also the leading driving actors in maintaining and preventing coastal abrasion.



**Figure 6.** Cycles of collaboration

### Challenges and Hopes

Some of the main challenges in the abrasion prevention mitigation policy in Mengkapan Village, Sungai Apit District, Siak Regency, Riau Province include: There are no specific regulations regarding coastal abrasion prevention and mitigation; the size of the budget to overcome abrasion; limited budget to overcome abrasion; lack of CSR support from the company; lack of accurate spatial data and research; Low public knowledge regarding the risks and prevention of abrasion; low community participation in the preparation of plans to overcome abrasion.

However, with the implementation of adaptive, data-driven development policies supported by all stakeholders, including community participation, coastal erosion can be controlled. Local governments need

to strengthen planning capacity, increase cross-sector collaboration, and ensure that every coastal development plan considers ecological factors.

### 4. CONCLUSION

Based on satellite imagery analysis from 2020 and 2025, Mengkapan Village is experiencing abrasion at a rate of 6.43 m/year. Development planning policies to mitigate coastal erosion must be an integral part of a sustainable regional development strategy. Through a combination of structural, non-structural, and collaborative approaches, along with strong policy support, coastal erosion can be minimized. Synergy among government, community, business, and academia is key to realizing a resilient, productive, and sustainable coastline for future generations.

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