

Environmental communication based on tourism management for mitigation of abrasion disasters

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Abstract. Indonesia has thousands of islands. However, many islands are threatened with sinking due to rising sea levels and abrasion. This research aims to explain environmental communication based on tourism management to mitigate abrasion on Bengkalis Island. The research method used was a qualitative approach with case studies. The results show that the Coordinating Ministry for Maritime Affairs and Investment together with other ministries, regional governments and experts collaborated to communicate to overcome the abrasion problem on Bengkalis Island. To mitigate abrasion, the government is building breakwaters, rehabilitating mangroves, and creating communication programs. The government's environmental communications involve the NGO Malay Youth Association that Cares for the Environment (IPMPL) to deal with abrasion, as was done at Raja Kecil Beach. This community-based tourism was built as a means of government communication to campaign for the protection of the coast of Bengkalis Island. The development of marine tourism that is integrated with the prevention of environmental damage not only contributes to the economy and community welfare but also contributes to environmental sustainability. Communication based on tourism management has not been managed well. Therefore, the government must involve other stakeholders for sustainable development in the context of mitigating abrasion disasters.

1 Introduction

As the largest archipelagic country in the world, Indonesia has thousands of islands. However, several islands are threatened with sinking due to abrasion and rising sea levels. Bengkalis Island, as a peat island, is highly vulnerable because the soil is subject to erosion of up to thirty meters every year. The coastal erosion is enhanced by the bog-burst [1]. Environmental damage is of course the result of deforestation, industry, cutting down mangrove forests, land conversion and excessive exploitation of natural resources. This is exacerbated by climate change which brings natural disasters, rising sea levels and high waves. So that this environmental issue has become the concern of the world community from various groups and institutions. Many countries use mangrove conservation and restoration as a climate change mitigation effort [2], in accordance with the Paris agreement on climate change in 2016 in New York. Related to this environmental problem, the

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Indonesian government has begun to make several policies to protect against more severe environmental damage. However, in its implementation, the handling and management of abrasion disasters has not received much attention from the authorities, especially in the communication aspect.

Coastal ecosystems must be protected because they provide many benefits to society, ranging from economic, recreational, and socio-cultural activities. Several studies have shown that wetlands are the most productive environment and are very important for human survival. The ecological function of mangroves is to maintain, protect and stabilize the coastline from abrasion, waves, and tides. While the socio-economic function of mangroves is as a source of livelihood, a source of building materials, nature tourism, cultivation areas and others [3]. These wetlands are also important for clean water supply, food supply and building materials, maintaining biodiversity, carbon storage, flood control, groundwater replenishment, and climate change mitigation [4-6].

The main concern of this research is environmental communication for community-based coastal abrasion mitigation in remote areas. Currently communicating about climate change and engaging the community in changing attitudes and behavior is a challenge in the context of rural or remote areas [7]. Bengkalis Island, as the outermost area has a peat soil structure that is neglected by the community. Peat lands on the coast of Bengkalis Island were eroded by waves causing landslides. Triggers for this process are deforestation, peat land conversion and drainage channels for plantations. This is exacerbated by excessive exploitation of mangrove forests for building materials, wood charcoal, firewood, and land conversion for shrimp ponds [8]. Over time, Bengkalis Island will sink if this environmental problem is not immediately resolved. The lack of communication to raise awareness of environmental concerns and weak law enforcement regarding mangrove forest felling have made this damage even more widespread. Therefore, it is hoped that the development of community-based beach tourism and mangrove ecotourism can become a communication channel to mitigate abrasion and prevent damage to mangrove forests on Bengkalis Island.

Community-based mangrove forest conservation to mitigate abrasion is carried out in the villages of Sebauk, Teluk Pambang, Deluk, Penebal, Mentayan, and others. Sebauk village has a Community Care Group for the Environment (Kempas), in Pambang village there is Kedabu community [8]. However, the existence of these groups was not fostered in a sustainable manner, so many mangrove trees were cut down. Several efforts to protect the mangroves and beaches of Bengkalis Island are community-based tourism management in some areas. Community participation can help increase public awareness of conservation actions, communicate, and overcome doubts to support conservation [9]. Community-based tourism management can be a strategy for achieving development goals because decision making on resources and the environment rests with organizations within the community [10,11]. Mangrove ecotourism management as part of conservation can be a means of communication and education for the public to care about the environment which is also a tourist attraction. In this way, tourism can be an aspect of realizing sustainable ecosystem management [10]. Even the development of ecotourism can contribute to increasing public awareness to conserve ecosystems and at the same time increase economic value [12,13].

Tourism development policy cannot be separated from community development and environmental development simultaneously and sustainably. Likewise, abrasion control policies for abrasion mitigation also require good and comprehensive communication. So that the tourism development strategy is not only oriented towards an economic approach but is directed towards an approach to environmental preservation, culture, and community empowerment. This empowerment approach is measured by the ability to explore the unique potential, wisdom, values, and culture of local communities. This is in line with environmental communication which seeks to increase society's ability to respond

appropriately to environmental signals that are relevant to the welfare of human civilization and natural biological systems [14].

Environmental communication strategies can collaborate between government, companies, communities, mass media, and other business actors to overcome the problem of abrasion on the coast of Bengkalis Island. Collaborative communication requires the identification and articulation of clear roles for each actor. This collaborative approach is useful for strengthening the ability to utilize social, political, economic, and institutional factors interacting with local ecological conditions. This approach also encourages a bottom-up and inclusive approach in adapting to climate change mitigation. This collaborative approach emphasizes the influence of cross-field interactions in strengthening the need for individuals to be actively involved in realizing communication goals [15]. In essence, collaborative communication requires the development of trust and respect among various stakeholders or communication actors. These environmental communication actors need basic communicative skills to enable collaborative communication, especially the skills needed to solve problems [16].

The communication model for mitigating abrasion disasters through preserving the natural environment based on sustainable tourism management is important to study. Therefore, this research focuses on environmental communication based on tourism development to mitigate abrasion disasters in Bengkalis Regency. This research takes an environmental communication perspective which is not only seen as a supporting instrument for the implementation of environmental management, but is also an inseparable part of environmental management itself [17]. In this case, without an appropriate communication strategy, environmental management will face many crucial problems.

2 Methods

This research was conducted using qualitative research methods with a case study approach. In this case, the case study was chosen because it can explore phenomena that are bound by space and time to explain the complexity of the problem under study. Case studies require researchers to play a greater role as the main instrument in research [18]. Research with case studies also leads to the exploration of complex phenomena to develop theories or evaluate programs being implemented [19]. In this regard, qualitative research methods have several benefits for developing environmental and risk communication programs [20]. The focus of the case in this study is environmental communication based on tourism management in abrasion disaster mitigation on the coast of Bengkalis Island. The case of Raja Kecik tourism development in West Muntai Village, Bengkalis Regency is interesting to study because it can mitigate and campaign for the risk of abrasion. In addition, the communication conducted can attract the interest of the public and tourists to care about the coastal environment on Bengkalis Island.

The location of this research is Bengkalis Island, Bengkalis Regency, Riau, Indonesia. This island is part of the outermost islands and borders directly with Malaysia. The condition of Bengkalis Island, which is prone to abrasion and its land which continues to be eroded by abrasion, is a concern for the central government. In addition, national borders continue to shift due to abrasion. The problem of the coastline as a lost national border has prompted the Indonesian government to create policies to control the damage that occurs. This outermost island area is a national strategic area which is a priority for the Indonesian government's development policy. The management of the outermost islands receives special attention so that their position as a sovereign state border area, environmental sustainability and natural wealth are maintained in accordance with the mandate of the law.

Bengkalis Regency is divided into three main regions. First, Bengkalis Island which has two sub-districts. Second, Rupat Island which also has two sub-districts. Third, the area on

3 Results and discussion

3.1 Environmental communication for abrasion disaster mitigation on Bengkalis Island

The management of abrasion disaster mitigation on Bengkalis Island is conducted by the central government under the control of the President of the Republic of Indonesia. The Indonesian government through the Coordinating Ministry for Maritime Affairs and Investment, the Ministry of Public Works and Public Housing, the Ministry of Environment and Forestry, the Ministry of Finance, the Riau provincial government, and the Bengkalis Regency Government made policies to protect the coastline from abrasion. As the outermost island bordering Malaysia, Bengkalis Island continues to be eroded by abrasion so that the border shifts. This is a priority for government programs. In addition, BRGM, as an institution formed through Presidential Regulation Number 120 of 2020, has the task of protecting and restoring peat and mangroves. BRGM is tasked with facilitating the acceleration of the implementation of peat restoration and improving the welfare of the people in the peat restoration area as well as conducting accelerated mangrove rehabilitation in the targeted provinces. In its field activities, this agency coordinates, communicates, and finances its activities directly through ministries, not local governments. This includes the mangrove rehabilitation program for community resilience in the coastal area of Bengkalis Island which is also part of a project funded by the World Bank [22].

Bengkalis Island, as the outermost island area, is a national strategic area to be managed. This area is part of state sovereignty, environmental control, and/or a world heritage site whose development is prioritized for national interests. Therefore, the management of the outermost islands requires special attention so that their position as a sovereign border area of the state, the preservation of the environment and the natural wealth contained therein and provide maximum benefits for the welfare of the community. The coastal area management policy has been mandated by law to be implemented in order to improve the welfare of the people in the area [23].

The condition of the coastal area of Bengkalis Island which is badly damaged and continues to be eroded due to abrasion, waves and sea currents requires the government to adopt policies to mitigate the disasters that occur. The government has built a breakwater, but it has not been managed sustainably. This is proven by the lack of communication with the regional government and other stakeholders to provide guidance to local communities. In addition, many mangrove rehabilitation activities fail due to lack of study and maintenance due to limited funds. However, the management of abrasion disaster mitigation has been conducted by the government in three ways. First, the government creates a rehabilitation program or planting mangrove seedlings in coastal areas affected by abrasion. Mitigation of abrasion disasters through this rehabilitation program is expected to play a role in protecting the coast from the waves, preventing seawater intrusion, maintaining community resilience, and preventing widespread abrasion. However, the programs of the central government, regional governments and communities also failed as a result of this wave. Most of the mangrove seedlings planted sank, drifted, and died.

Second, the government, especially the central government, is building breakwaters to withstand waves in several areas prone to abrasion, especially in the north of Bengkalis Island. The Bengkalis regional government's program to build a breakwater by concrete on the shoreline also suffered damage, because it did not last long. Third, the government fosters and invites the community to change the behavior of people who live around the coast to actively participate in protecting the beach. However, the third step is less intensive and not creative, conducted by the government. This third step should be able to use collaborative

communication strategies and use integrated communication ways (multimodal communication).

Table 1. Abrasion disaster mitigation methods and target stakeholders.

	Function	Stakeholders	Weakness
Mangrove rehabilitation program	Protecting the coast from big waves, preventing seawater intrusion, maintaining community resilience, preventing widespread abrasion, and adding to the coastline in the long term	Central government, Local government, universities, NGOs, mass media, corporations, local communities, fishers, farmers, etc.	The program seems careless, the seeds are easily washed away and die, the planting program is not followed up with maintenance, and inappropriate targets audience.
Breakwater Development Program	Reducing the rate of abrasion, breaking waves that lead to the beach, trapping sand sedimentation, protecting the coastline from abrasion, and becoming a means of tourism	The President, Several related ministries, Peat and Mangrove Restoration Agency, provincial governments, district governments, and the World Bank	Breakwaters with large boulders cost a lot of money and concrete breakwaters on beaches are prone to damage, sinking and toppling
Environmental communication programs	Educating the community, collaborating with stakeholders, campaigning not to cut down mangroves, taking part in protecting and planting mangroves, having concern for protecting the seacoast, etc.	Local community (fishers, farmers, Kemangteer, inside), NGOs, central government, provincial government, district government, universities, corporations, environmental activists, tourism activists	Lack of studies, inappropriate target audiences, messages and media are not creative yet, lack of collaboration with other stakeholders, coaching is not sustainable, and there is no communication program audit

Source: Research results

These methods are closely related and complement each other as abrasion mitigation activities on Bengkalis Island. The implementation of these methods requires communication with stakeholders to make the three programs a success. Collaborative communication is needed to formulate goals, choose channels, choose messages, campaign, and provide direction so that the community plays an active role in each program and is skilled in protecting the coastal environment. Apart from that, the most basic thing that needs to be prioritized is intensive environmental campaigns and communication so that the entire community is aware and actively involved. In this case, the Indonesian government places this problem as the main problem that must be resolved together with other stakeholders [22]. However, the implemented program has not optimally synergized with existing stakeholders and has not been sustainable. Even though the handling of the abrasion problem must be sustainable and synergize with the development of tourist destinations and public awareness to care for the environment which can also support the community's economy.

The government is constructing breakwaters at several points in the north of Bengkalis Island to mitigate abrasion disasters. The construction of breakwaters requires large funds, the local government is only limited to building turabs or culverts in certain coastal areas. At

the Raja Kecik tourist site, breakwaters and culverts were built to withstand the strong waves of the Malacca Strait, protect the land from rapid abrasion, and protect planted mangrove seedlings. The construction of the breakwater aims to withstand severe abrasion rates such as in Muntai Village (see Figure 2). The Raja Kecik Beach area, which was built by a breakwater has been utilized by the local community as a tourist attraction. This tourist destination also aims to campaign for beach awareness, maintain culture, and improve the community's economy. This Raja Kecik tourist destination has become a means to convey environmental messages so that it gets national coverage, especially when President Joko Widodo visited this location.



Fig. 2. One of the beaches affected by abrasion is in Muntai Barat Village.

The mangrove rehabilitation program conducted by BRGM, the Ministry of Fisheries and Maritime Affairs (KKP), and the Ministry of Environment and Forestry (KLHK) using the National Economic Recovery (PEN) approach during the Covid 19 pandemic was effective not only aiming to protect the ecosystem but also provide additional income for coastal community. This program seeks to restore, enhance, and maintain mangrove ecosystems. However, the rehabilitation program for abrasion disaster mitigation has not been conducted in an integrated manner starting from BRGM, KLHK, KKP, local government, community, NGOs, and the private sector to make this program a success. Even this government program has not been able to stop the rate of beach abrasion and can even reach 10 to 40 meters per year in West Bengkalis Muntai. In this case, the head of the NGO IPMPL and the head of the tourism management explained that Bengkalis Island could sink if it was not managed quickly. He emphasized:

“This mangrove rehabilitation program does not seem serious about saving Bengkalis Island. Likewise with the breakwater program which is only eight hundred meters long to save thirteen kilometers which were quite badly affected by abrasion in two villages namely Muntai and West Muntai Villages. If measured as a whole, Bengkalis Island was very badly affected by abrasion, approximately 65 kilometers. If every year the government can only build eight hundred meters, Bengkalis Island will sink first, then the breakwater will be completed. We hope that the breakwater program can be built all at once” (Interview, Solihin, April 20, 2023).

In this case, the government has limited budget to address the problem of abrasion in this region. However, the government has used environmental communication by inviting the community to rehabilitate mangroves as a form of abrasion disaster mitigation. Figure 2 shows the Indonesian president giving a speech to convey the message of the importance of rehabilitating mangroves to mitigate worsening abrasion. In addition, the government appreciates the abrasion disaster mitigation conducted by the community through the development of community-based tourism managed by IPMPL. Government synergy through the rehabilitation program is expected to support regional tourism and the local community's economy.



Fig. 3. Mangrove rehabilitation campaign at Raja Kecik Tourism

Government policies to build breakwaters, rehabilitate mangroves, and environmental communications still have many drawbacks. The idea to build marine tourism from the NGO IPMPL strengthens the government's beach rehabilitation program and strengthens community resilience in the face of abrasion disasters. This rehabilitation program is still not sustainable because it does not pay attention to post-planting maintenance. In addition, community development has not been conducted intensively to provide expertise to the community in managing mangroves and maintaining tourist destinations that are built. Even though environmental development and tourism development must be sustainable because it is closely related to environmental communication which has aspects of community education at large. In addition, sustainable tourism and environmental development also requires collaborative communication from many stakeholders, not only aimed at local communities for active participation, but also visitors, for media coverage and discussion on social media [24,25]. However, these tourism development activities can be an effective channel of communication and social interaction to provide environmental awareness.

3.2 Environmental communication through community-based tourism

The development of Raja Kecik Tourism in West Muntai Village is a means of communication to increase community awareness in protecting the coastal environment on

Bengkalis Island. The main tourist attraction of Raja Kecik is the Datuk Bandar Jamal Bridge which is supported by views of the beach and breakwater. Apart from that, there are various other events that are regularly held such as fishing competitions, religious events, and so on. This tourist destination is the idea of the Environmentally Concerned Malay Youth Association (IPMPL) and is managed by the community through a cooperative institution. The central government involves these local community groups as the main actors in developing coastal tourism and implementing mangrove rehabilitation programs to mitigate abrasion disasters. The ecotourism development system has been regulated in Minister of Home Affairs Regulation number 33 of 2009 concerning Guidelines for Ecotourism Development in Regions which requires the empowerment of local communities [26]. The government indirectly makes this group a communicator, channel, media, and content to spread messages about caring for the environment, especially for abrasion disaster mitigation. This beach tourist location was visited by the president, then this location became viral on social media and was widely reported in the mass media. In this case, the message of environmental communication to rehabilitate mangroves has received a lot of public attention. The development of this tourism has an important contribution to ecosystem conservation [12].

The development of Raja Kecik marine tourism is sought to help mitigate and protect coastal areas from abrasion and more severe environmental damage. Tourism that is built not only contributes to increasing the income and welfare of the local community but is also able to increase people's environmental awareness. The concrete framework implemented by IPMPL emphasizes that meaningful communication and engagement must be action-oriented and occur both physically and materially [7]. So, abrasion and damage to mangrove forests can be mitigated through the application of appropriate policies and communication strategies. Collaborative mangrove rehabilitation and environmental education based on tourism destination management can support sustainable development [4].



Fig. 4. The views of breakwater, visitors, and the beach in the @wisata_raja_kecik Instagram post.

Datuk Bandar Jamal bridge has a length of nearly one kilometer to the center which is a major tourist attraction. The bridge is a sign of the loss of the lost land of Bengkalis Island. This symbol is interpreted as the spirit of the country in maintaining unity and towards prosperity. This symbol also means protecting the country must protect the environment.

Even the selection of names in the tourist sites uses many historical symbols of the greatness of the Malay people. The choice of the name Raja Kecik was because he was the name of the king and founder of the Siak kingdom, namely Sultan Abdul Jalil Rakhmat Syah. Likewise with the choice of building names and supporting infrastructure at this tourist location, all of which are very meaningful and of historical value. These names are taken from Malay customs and figures in the Siak kingdom. Collaborative environmental communication by elevating the local wisdom of the Malay community can help aspects of sustainable development. Environmental communication collaboration with tourism activities also contributes to bringing important messages for abrasion disaster mitigation. These environmental messages are conveyed not only to educate, to care for the environment, but also to teach Malay values and past history. Marine tourism with the attractions of bridges, beaches and breakwaters does not limit people, anyone can pass by and enjoy the beauty of Raja Kecik beach (see picture 3). In this case, the initiator of the IPMPL NGO who is also the tourism manager explained:

"We have made the Datuk Bandar Jamal bridge as an icon for Raja Kecik Beach Tourism. We name the tourism objects using terms, symbols, and historical values of the Malay people from the Siak kingdom. Raja Kecik was the founder of the Siak kingdom. Datuk Bandar Jamal was the commander of the navy. We developed this tour together, there are youth and the community. We charge tourists who enter this tourist attraction. We use the money for facility maintenance operations. Many visitors take selfies on the bridge, bridge ends, piles of breakwaters and on beaches formed from sedimentation (Interview, Solihin, 20 April 2022).

This community tourism activity has not received ongoing guidance from the tourism agency of the Bengkalis government. Some coaching is conducted by university lecturers through research and community service programs for lecturers and their students. The local government does not participate in the management of Raja Kecik tourism because the land belongs to the community. This problem is still an obstacle to its development. These non-tourist communities are managed by the government, but on the other hand the management is assisted by the government. Because it was conducted by the community, even village officials could not take part in the management of Raja Kecik Beach. Local governments were only able to provide moral and ceremonial support, citing limited funds. Because this tourism development has attracted the attention of the provincial and central governments through the IMPPL managers. Dimas Asri Agustin as functional official for tourism in Bengkalis Regency explained:

"The tourism managers and the local government have coordinated for the development of Raja Kecik tourism. We support every planning of tourism development in Bengkalis area. Managers have indeed proposed several programs. The Bengkalis Regency Government's budget is limited, so it is impossible for us to spend it only on the construction of Raja Kecik Beach" (Interview with DA Agustin, 18 April 2022).

This tourist area belongs to the community, so the management of Raja Kecik tourism is conducted by the local community. Some of these people donate their land for the development and expansion of this beach tourism. Of course, this community spirit is very good as a capital for developing sustainable ecotourism. These communities participate in managing and developing tourism, as food sellers, coast guards, and maintainers of tourist attraction facilities. Community activities in tourism management are also synergized with environmental campaign efforts as a form of mitigation of coastal abrasion disasters in their area. However, they cannot do much to prevent abrasion because there is no method that is precise, fast, and easy to apply. The only solution is to build a breakwater, but it is expensive. This was also stated by Solihin:

"The community is actively involved in managing Raja Kecik beach tourism. The managers are all Indigenous people of West Muntai Village. The people also want to give

environment, especially in the management and development of regional tourism [30,31]. In this case, society has an important role in controlling environmental damage according to its wishes. Therefore, community participation is absolutely necessary in disaster mitigation [32]. However, these communities must be equipped with more knowledge and skills through training and mentoring so that they can manage the environment and develop tourism in a sustainable manner. The community as part of the agents of change in their environment must be able to develop products and market the local products they produce more creatively. In this case, creativity in managing tourist destinations has an important contribution in fighting economic inequality, especially with community-based management.

One important mitigation measure is an awareness campaign regarding mangrove conservation issues. This study provides important information regarding the vulnerability of natural abrasion disasters to humanitarian disasters if continuous communication is not carried out. Therefore, managing environmental communications by utilizing community-based tourism is the right communication strategy. This step deserves support from all stakeholders because the effects are not only local but also global.

4 Conclusion

The government's abrasion disaster mitigation policy is conducted by building breakwaters, rehabilitating mangroves, and carrying out environmental communications. However, this communication program has not been supported by sustainable communication to mitigate abrasion disasters. The government's environmental communication with its stakeholders through tourism management plays an important role in changing people's views and behavior towards the environment. Community involvement can be a solution to overcome abrasion in the long term, and can even improve the community's economy, such as the Raja Kecik tourist attraction. The government in mitigating abrasion disasters must involve many stakeholders, using multimodality communication. This tourist destination can be a means of communication for all elements to increase public environmental awareness. Community-based tourism managed by IPMPL is used to encourage people to care about beaches through movements: planting, maintaining, and preserving mangroves. In essence, integrated tourism development with abrasion disaster mitigation not only plays a role in improving the economy and community welfare, but also contributes to environmental sustainability. The weakness of environmental communication based on tourism management conducted by IPMPL is that it is still poorly coordinated with other stakeholders. Therefore, the government, universities, private sector, influencers, mass media, BRGM and NGOs must build collaborative communication to make tourism development a success to mitigate abrasion disasters. Future studies must be able to evaluate government policies and examine communication based on local community wisdom to find appropriate solutions for abrasion management programs.

Thanks to DRTPM-Ministry of Education, Culture, Research and Technology of the Republic of Indonesia for funding this research. Institute for Research and Community Service (LPPM) University of Riau which has facilitated. Thank you also to all research informants who have supported this research.

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